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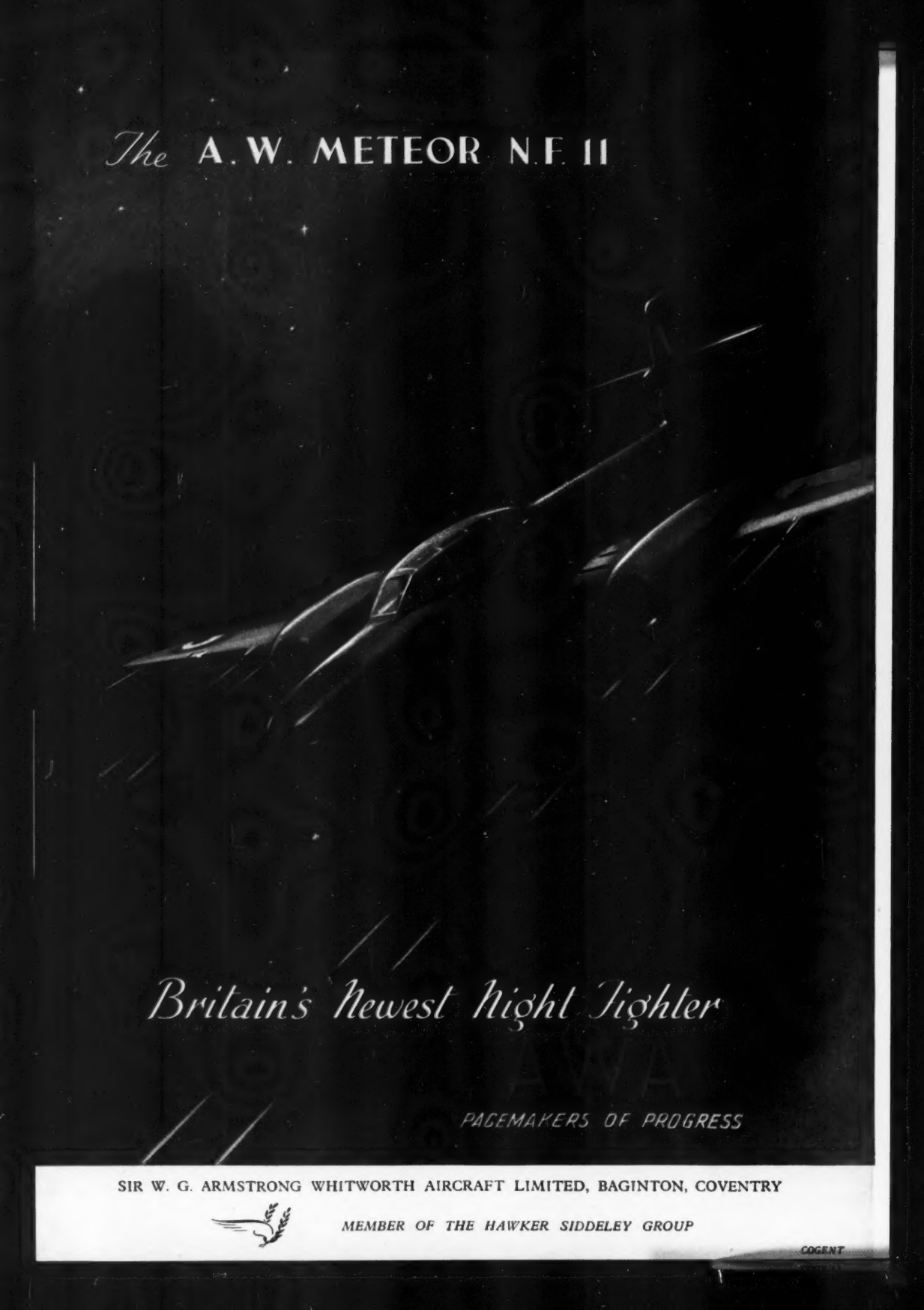

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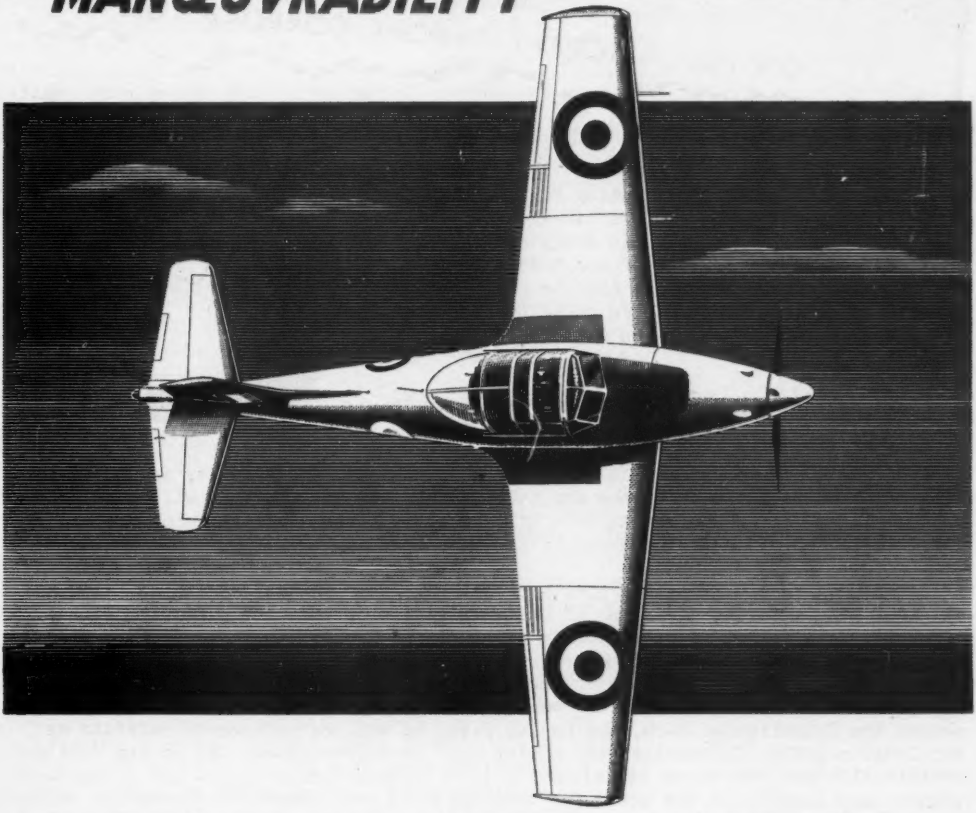

FIGHTER-LIKE MANOEUVRABILITY is no idle claim where the Balliol is concerned At eighty-five per cent of the designed diving speed its rate of roll is 105 degrees per second. and its "feel" and handling qualities are in fact very similar to those of the latest fighters now going into service

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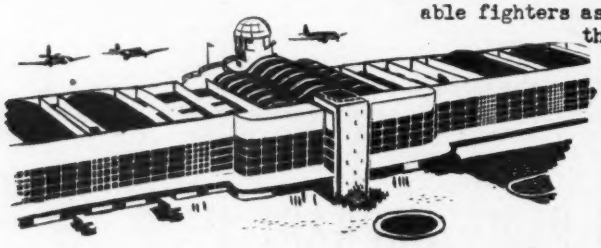
UNITED AIRCRAFT EXPORT CORPORATION

Dear Sir:

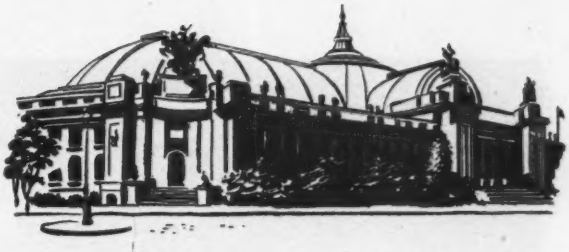
The aircraft world is looking forward with interest to the 19th Salon International de l'Aeronautique, which will take place in Paris during the last half of June. In view of the traditional role of France as a pioneer in all aspects of aviation and the great importance of her contributions there to, the forthcoming exhibition will attract wide attention.

The exhibition will be held simultaneously in the Grand Palais on the Champs Elysees and at Le Bourget Airport. In the Grand Palais will be exhibited light and medium-weight aircraft, also engines, accessories, ground equipment and machine tools of France and other countries; and airlines will have booths and displays. At Le Bourget Airport will be shown those aircraft which are too large to be exhibited at the Grand Palais.

United Aircraft Export Corporation will have representatives at the Salon and all four manufacturing divisions of United Aircraft Corporation - Pratt & Whitney Aircraft, Hamilton Standard, Sikorsky Aircraft and Chance Vought Aircraft - will participate. There will be some especially interesting exhibits, including (1) a cutaway Pratt & Whitney Wasp Major engine -- a 3,800 horsepower giant which is the most powerful piston engine in the world, and now powers such intercontinental bombers as the Consolidated B-36, the Boeing B-50, as well as such cargo carriers as the Douglas C-124 Globemaster, the Boeing C-97 Stratofreighter, the Boeing Stratocruiser Airliner, and other big aircraft; (2) a cutaway Double Wasp - one of the most widely used engines in the world for both military and commercial aircraft. During World War II the Double Wasp powered such memorable fighters as the Republic P-47 Thunderbolt, the Vought F4U Corsair and the Grumman F6F Hellcat; (3) a model Chance Vought Corsair airplane - the only fighter of the last war of such advanced design as to warrant continued, uninterupted production, and the only propeller driven fighter now being produced in America; (4) a model of a Sikorsky S-55 helicopter - which has been ordered in increasing numbers for use by all branches of the U. S. Armed Forces. The S-55 succeeded the S-51 which is performing so brilliantly today in the Korean conflict not only in liaison, rescue, spotting and supply assignments, but also as an effective plane-guard for aircraft carriers of the U. S. Navy; (5) Hamilton Standard, in addition to showing the latest development in propellers, will display the newest cockpit air conditioning



unit used in high-speed jets. This unit takes in 240 cubic feet of air every minute at a temperature of 600 degrees F. and delivers it to the cockpit at just below freezing point. The best measure of the performance of this unit is its ready acceptance by the aircraft industry, and the fact that production orders have already been received for its installation in three of America's top jet fighters; (6) engine vibration equipment manufactured under Pratt & Whitney Aircraft license by MB Manufacturing Company, Inc., also, special Hamilton Standard propeller tools manufactured by Kell-Strom Tool Company, Inc. We are happy to have this opportunity to display our products and all those who attend the Salon are invited to visit our exhibits, which will be centrally located on the Main Floor of the Grand Palais.



The French aeronautical and air transport industries will be well represented and we are deeply gratified that our own engines and propellers will play such a liberal part, through installation in some French-built aircraft.

The first Salon International de l'Aeronautique was held in Paris in 1908 and the succeeding exhibits have chronicled the achievements of the world, and particularly France, in the field of aeronautics. When we consider that the scientists and engineers of France have always taken a progressive and farsighted attitude in aviation, and that they have repeatedly shown remarkable imagination, skill and courage in aeronautical construction and in flight technology, it is indeed appropriate that a display of world-wide scope should be given in Paris.

When it is considered that less than six years have elapsed since the ending of the Second World War, with its devastating effect upon all French industry, the world must pay tribute to France and her aircraft and airline leaders for the extraordinary strides made in aviation during a time when profound readjustments had to be made in the nation's war-displaced economy.

All those who are interested in man's progress in flying have been invited to view not only the results of French achievements in this field, but also the aeronautical products of other countries, including those of the United States. With the yearly growth in travel to France, it is expected that the Salon will receive enthusiastic patronage.

To the management of the 19th Salon International de l'Aeronautique we extend every good wish for an outstanding success.

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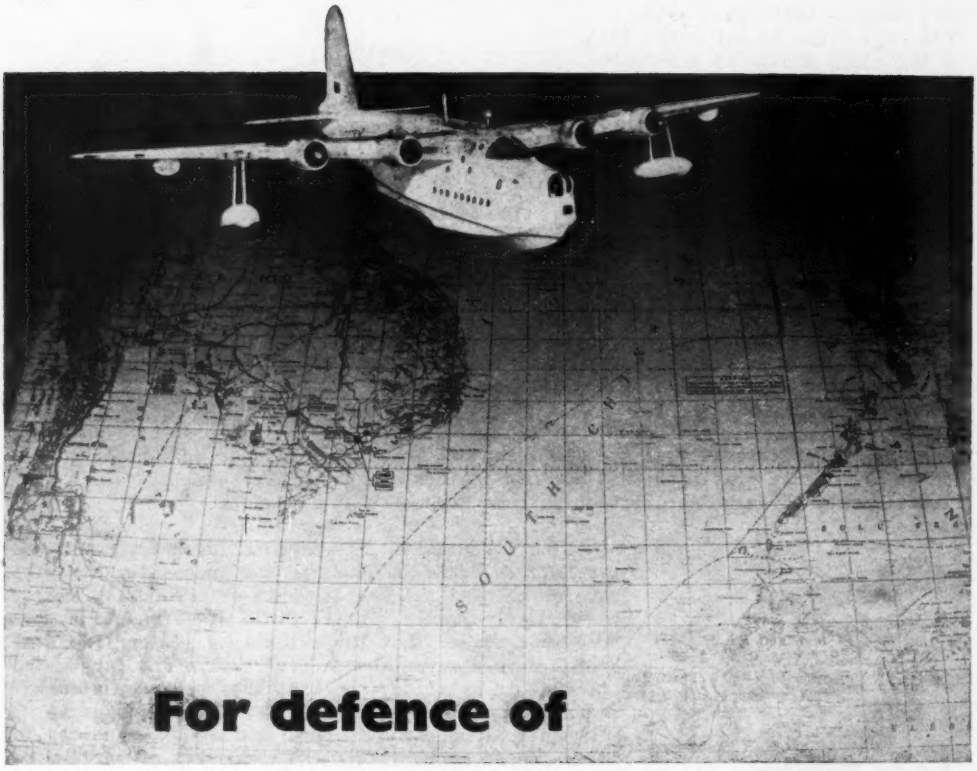

vast sea areas...

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(Aeroplane photograph)

The naval version of the S.51 known as the "Dragonfly" has now been officially adopted by the Royal Navy.

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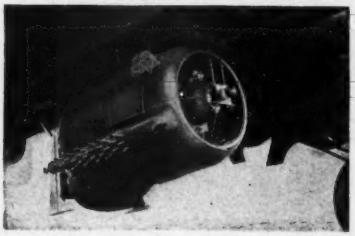

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Orderly Control of the Air

IT is time that a word of praise was given to those who have dovetailed together the diverse traffic requirements of the almost countless commercial and military aircraft now operating over this small country, and have devised a tolerable and practical scheme for controlling them and ensuring a high degree of safety in the congested zones—in particular the London area. The problems are by no means all solved, but a good start has been made, and there is reason to believe that the first turbine aircraft to operate in and out of London—the Comets and Viscounts—will be able to do so without upset to themselves or to more leisurely types.

The introduction of the Instrument Rating for civil and Service pilots has also been something of a co-operative effort, necessitated by the new traffic conditions and the acceptance (and part realization) of the aim of all-weather flying.

When examined in syllabus form, qualifications for the Instrument Rating are rather terrifying to the average non-professional pilot, and, so far as the Services are concerned, many pilots are hard put to it to find the necessary qualifying hours of actual instrument flight—though this is sometimes due to anomalies in methods adopted for log-book keeping. However, the general revision of airmanship entailed (including as it does navigation, aviation law, handling, met., procedures and so on), quite apart from flying practice, cannot fail to make for better pilots. Any who can do so would be well advised to try to reach the standard called for, even if they have no idea of flying intentionally under I.F.R. conditions. For the air pilot even more than for the sailor, and in spite of the best meteorological forecasts, conditions may change with disconcerting suddenness; and it is better to be safe than sorry.

Fact-facing

ONE of many terms which have come into common usage during and since the war is "wishful thinking." It is a simple and expressive phrase, and on first analysis suggests little more than a pleasant optimism or make-believe that may even be laudable. Recently, Dr. J. C. MacGown, president of the Pathfinders, gave a definition of insanity as "the inability to face the reality." This puts a much more serious complexion on certain types of wishful thinking, and we have in mind the many people who prefer to disbelieve in an existing state of affairs because they sincerely wish it were otherwise. It was in this sort of category that the doctor placed pacifists who endeavour to delay our defence effort. Senior officers, in recent speeches, have also drawn attention to this lack of what may be called public awareness.

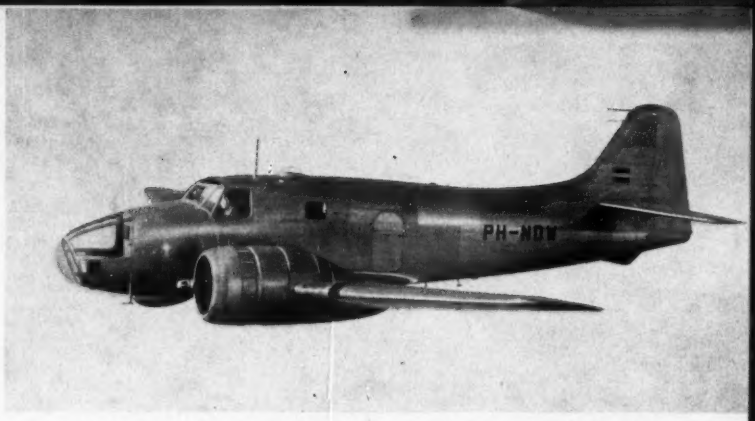
Where the safety of the country and our lives are concerned, such an attitude can be a fatal one. Britain is committed to a tremendous rearmament programme which will sadly upset her economic recovery and make every individual poorer. It is regrettable, but has become inevitable, though every attempt has been made to avoid it during the last five years.

The time has thus come for everyone to make sure that we get the best value for our efforts and money, and for a start many petty restrictions and hindrances should be removed. For example, let's have no more fuss about the noise of training aircraft. Let us remove without delay the restriction on hours during which night flying may take place in the Volunteer Reserve, for what worthwhile flying training can be achieved in the summer months between darkness and midnight? It may here be mentioned that the Chipmunks used at V.R. schools near London and other cities seem to be somewhat quieter than Tiger Moths, though both have the Gipsy Major engine.

As another example, having lost our sole full-scale range on Heligoland, let us secure at least one alternative so that the C.-in-C. Bomber Command may order realistic exercises for his crews. To pay millions of pounds for equipment on the one hand, and on the other to prejudice our chances of using it to the best advantage in the hope that we may never have to defend ourselves, is truly a refusal to face up to reality—a form of insanity, in fact.

No. 42 of the Series

By
THE EDITOR



The S.13 crew and pilot trainer is well proportioned when seen in the air, and this photograph shows the exceptionally good view afforded to the pilots and bomb aimer.

FOKKER S.13 in the Air

Impressions of a Netherlands Twin-engined Design for Pilot and Crew Training Rôles

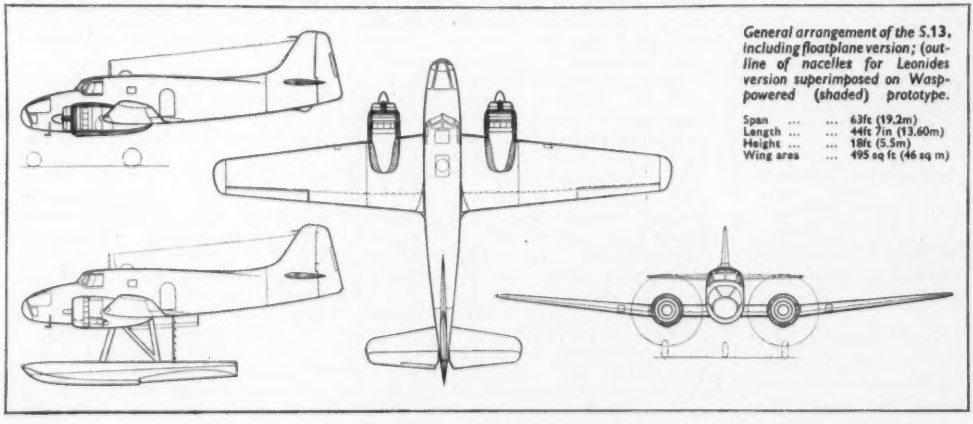
IT is particularly gratifying when from time to time *Flight* is invited to fly a new aircraft produced by a foreign manufacturer. The handling notes and comments which we are thus enabled to offer serve to introduce the aircraft to readers at home and abroad who might never otherwise see it in the air or know anything of its flying qualities.

Recently we made a flying visit to Holland in our Gemini in order to assess the Fokker S.13 two-engined pilot and crew trainer. Before describing experiences at the controls a word or two may be said about the methods of testing adopted for this aircraft by the constructors and authorities. A very comprehensive test schedule has just been completed, and the aircraft is to be made available for demonstration at Le Bourget during the Paris show. Briefly, Fokker test pilots have carried out the preliminary flying trials and the development along A.P. 970 lines. In addition, the Institute of Aircraft Development, N.I.V., a corporation of the Government, industry and military authorities (shipping interests were also at one time more closely concerned), called for complete tests as indicated by the National Aircraft Laboratories, N.L.L. These approximated to the full A.P. 970 programme and were carried out by Fokker pilots under N.L.L. supervision and carrying N.L.L. auto-observers. This arrangement may be likened to the co-operation between Boscombe's boffins and handling flights. Certain tests of a functional nature were finally carried out by Service pilots.

During trials, and on the occasion of our own flight, the aircraft carried only test equipment, ballast tank and automatic observers. Service equipment will be installed if and when an order is placed and depending upon which of several training rôles the S.13 is chosen to fulfil. It is equally well suited to the work of crew training or intermediate pilot training, or both.

In passing it must be pointed out that the Pratt and Whitney Wasp S.1H1-G (geared) engines installed in the prototype are very similar to the Wasp in the Harvard, and Fokkers feel that this adds an appeal in several countries where adoption of the S.13 with a known engine would involve very little additional engine-spares provisioning. The aircraft at present has dissimilar engines, one with 10 to 1 blower ratio and the other with 12 to 1; this gives a 1,500ft difference in critical altitude. The 12 to 1 version will be adopted. Whether or not geared Wasps will be available for a production batch of S.13s remains to be seen.

An alternative engine for the S.13 is, of course, the Alvis Leonides, and nacelle outlines of considerably reduced dimensions are indicated in the g.a. drawing. The Leonides is of much later conception than the Wasp, and is now becoming well established abroad as well as in this country. A considerable production order for these engines has been placed to meet Service needs. The disadvantage from Fokker's point of view is the reduction of power by approximately 60 h.p. on each side. The S.13 has, in fact, justified its estimated performance figures, and in some important instances has improved upon them. However, in extreme



General arrangement of the S.13, including floatplane version; (outline of nacelles for Leonides version superimposed on Wasp-powered (shaded) prototype.

Span	...	63ft (19.2m)
Length	...	44ft 7in (13.60m)
Height	...	18ft (5.5m)
Wing area	...	495 sq ft (46 sq m)

This prototype of the Fokker S.13, having completed an exacting test schedule, is being prepared for demonstration during the Paris Show.

engine-cut cases at the present maximum all-up weight, a loss of 60 h.p. on the good engine side might prove too much in spite of the reduced frontal area (over 10in in diameter) and weight (100lb per unit) of the Leonides. Should a Leonides version be produced it is probable that the present extreme airscrew tip clearance requirements might also be altered and a shorter, lighter and more attractive undercarriage substituted. This should also make for better nacelle forms. The present landing gear is of Fokker design, with Dowty legs and Dunlop wheels and brakes.

It is understood that design mods have been prepared to eliminate the faired bump produced by a not quite fully retracted nosewheel. A normal tyre with shimmy-damping will probably replace the present twin-contact tyre. The air scoops below the Wasp cowlings are to be removed in favour of internal intakes.

Inside the S.13 there is a fair amount of room. Of the permanent features incorporated in the prototype are the radio rack behind the first pilot; the large escape hatches above the cockpit, around and including the astrodome and the knock-out main door itself; and the cabin rear bulkhead positioned well forward and separating equipment such as oxygen, flare chute, camera and V.H.F. radio from the cabin proper.

The cockpit layout is adequate and functional, exhibiting both British and American influence. Instrument provision and layout are to a considerable extent a matter for the customer, but the full blind-flying panel on the left would be retained, while engine dials, mostly of the multi-needle type, will continue to be grouped centrally. In a crew-trainer version there would be no dual controls, and access to the bomb aimer's wide-open position in the nose would be the easier for that reason.

On the central pedestal are found the trimmers and a large number of levers for two comparatively small engines. They control power, pitch, mixture, oil temperature, air-intake temperature and engine temperature. At the base of the pedestal are also found the priming pump and flap and undercarriage controls. I am by no means convinced that a single dial with three separate needles indicating different things is desirable, although two r.p.m. needles on one dial obviously represent a practical and convenient economy in space. Again, an outline of a small aircraft which rather indistinctly folds its wheels and flaps in unison with those of the aircraft proper is to my mind no substitute for standard R.A.F. type undercart indicators.

Ignition-switch Design

It is interesting to hear that many pilots on the Continent dislike the average British twin-tumbler ignition switches, regarding them as though they had been borrowed from the office wall. Personally, I like their simplicity as much as I dislike the twist-type several-position alternative switch which might have come off the dashboard of a 1930-vintage car. I can still recall the sickening silence as a war-time pupil ran-up his Harvard and, on testing the magnetos, overshot the switch position to full cut. The present elevator-trim indicator on the S.13, incidentally, is a poor thing, but Fokkers have the matter in hand.

Once installed, the Wasps were started up without delay, though encouraged at first with the aid of the wobble pump. Having no handling notes either in English or Dutch I was dependent upon verbal instructions. Schiphol tower roared back its permission to taxi in answer to our request *via* the highly sensitive Phillips V.H.F. set, then, confident of the S.13's docility and good field of vision on the ground, my co-pilot invited me to go ahead without demonstration or instructions. Certainly the aircraft handles pleasantly and can be manœuvred across the huge apron at Amsterdam's fine airport with the minimum of brake or power. Brakes are applied by a lever mounted on the control wheel, and operate differentially in the usual manner.

Having lined up on the runway and made the standard checks (no flap was used), I opened up and, because of the different take-off boost settings for the two types of Wasp and the absence of an effective throttle gate, handed the throttle over to the co-pilot as soon as the aircraft had gathered speed on the run. The take-off weight was almost 12,000 lb, which is some 1,750 lb below the maximum, and the S.13, accelerating rapidly, was ready to lift its nosewheel at about 70 m.p.h., then with a scarcely appreciable pause was airborne, climbing and building-up speed rapidly. The full-load take-off run quoted for 5 m.p.h. wind is 1,000 ft. I was advised to climb at 110-115 m.p.h. I.A.S., and was somewhat surprised at the rapid build-up of speed and subsequent steep climb.

Schiphol control had requested that we fly contact while near the airfield, so I levelled out below layer cloud and settled down to an economical stooge while getting used to the feel of things.

The frontal appearance of the S.13 is by no means unattractive, although the prototype is equipped with an undercarriage which gives it a stilty appearance on the ground. The engines are Pratt and Whitney Wasps.

Even at 1,750 r.p.m. and boost in the middle 20s, the level speed was about 150-160 m.p.h. Response to controls was quite lively, and harmonization was good. My only criticism was not, apparently, news to Fokkers, who are already tackling the problem of excessive friction in the aileron circuit.

At very low power the cockpit is reasonably quiet, but higher up the curve the engines get a substantial buzz on. The pilot's view of the countryside through the huge, low-cut side panels is excellent.

Having ascertained that the S.13 is docile and is in fact what used generally to be called an "old gentleman's aircraft", we sought a gap in the clouds above which to stall. A quick climb to 6,000ft gave space and good visibility, and there I cut back the power and tried a wheels- and flaps-up stall. Good warning by buffeting is given, and control remains until very late, a more or less straight sink occurring at about 78 m.p.h. I.A.S. With flaps down the stall is more abrupt, and there is not much warning; indicated speed then seems to be about 70 m.p.h.

On the way down I worked the controls over at speeds up to 250 m.p.h. I.A.S. and, except for the tightening-up to be expected, found no change calling for comment. The S.13 must be cleaner aerodynamically than it looks, if one may judge from its reluctance to slow down on the circuit or at other times, and from its readiness to accelerate up to maximum cruising speed of nearly 200 m.p.h.

Concerning trimming, the aileron and rudder trimmers are good, but I felt that the elevator trimmer could be higher geared with advantage. As I found when flying with the port engine feathered, the rudder trimmer is very powerful. When restarting the feathered engine, I centralized the trim control in advance and took the load on the rudder while the "good" engine was giving maximum cruising power. It would certainly not be comfortable to fly that way for long, but the trimmer took the full load at about two-thirds of its range of movement. The S.13 handles comfortably with one engine feathered, and flies at about 140 m.p.h. with the other at economical cruising power.

Returning to the airport, we requested landing instructions and then made, in all, three landings, one of which was in the nature of a demonstration illustrating the versatility of the S.13. Although it can, and usually is, treated as a large aircraft and as such is flown in on a wide, conventional approach, it can without danger be virtually thrown in like a small trainer, popped down on the end of the runway, and braked to a stop in a very short distance.

(*Continued on page* 611)

FROM ALL QUARTERS

Gas-turbine Anniversary Celebrations

THE Saro S.R. A/1 fighter flying-boat (two Metrovick Beryls) is to be moored in the River Thames near the South Bank Exhibition during British Gas Turbine Week, from June 18th to 23rd. Organized by Power Jets (Research and Development), Ltd., at the request of the Festival authorities, and with the help of many firms, the week is intended to celebrate the tenth anniversary of jet propulsion and to focus interest on British initiative and achievement in this field.

The S.R. A/1 will land in the lower reaches of the river, and be towed up to the South Bank site. The Naval vessel M.T.B. 5559, which has a Metrovick marine gas-turbine power unit, will be moored nearby, and will make demonstration runs.

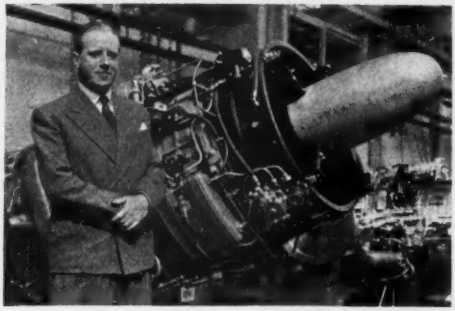
Within the exhibition itself, special emphasis will be placed on the existing gas-turbine exhibits, one of the most notable of which is an early Whittle unit just as it remained after turbine failure during a bench-test in 1940. The Rover turbine-powered car will be on view, and in the Telecinema the documentary film *Wonder Jet*, telling the story of Sir Frank Whittle's achievement, will be shown. Near the Transport Pavilion will be a gas-turbine information bureau.

Also in celebration of the anniversary, a unique banquet is to take place in London next Thursday, May 31st, at which some 300 senior air force officers, aircraft constructors and technicians of 30-odd nations will be present; among them will be Marshal of the R.A.F. Sir John Slessor and General Hoyt S. Vandenberg, U.S.A.F. Chief of Staff. Mr. T. O. M. Sopwith and Sir Frank S. Spriggs will act as hosts, and during the evening presentations will be made to Sir Frank Whittle and to Mr. W. G. Carter (technical director of Gloster Aircraft) in honour of the work as designers in the historic engine and aircraft.

The story of ten years of jet-propulsion progress has already been told in a recent issue of *Flight*—the Gas-turbine Number published on May 11th.

H. T. Chapman for Hawker Siddeley Board

ON his return from America, which he visited with other Armstrong Siddeley Motors executives in connection with the production of the Sapphire by Curtiss-Wright, Mr. H. T. Chapman, F.R.Ae.S., M.I.Mech.E., managing director of the Coventry firm, has been appointed to the board of the Hawker Siddeley Group. Now fifty-four years of age, Mr. Chapman served in the R.F.C. and R.A.F. during the First World War, and was subsequently employed with the Parsons steam-turbine works, next as a colliery engineer, and then in the design offices at the Elswick factory of Armstrong Whitworth. In 1926 he joined Armstrong Siddeley, and was responsible, as a designer, for the Leopard, Double Mongoose, Cheetah and other famous A.S. units. Later he was put in charge of production, and between 1937 and 1944, as works manager, he superintended the manufacture of over 28,000 engines and a great deal of war material of other kinds. In December 1944 he was promoted to deputy general manager, and to general manager in the following April. He was appointed to the A.S. board in April 1946, and became managing director in September last year.



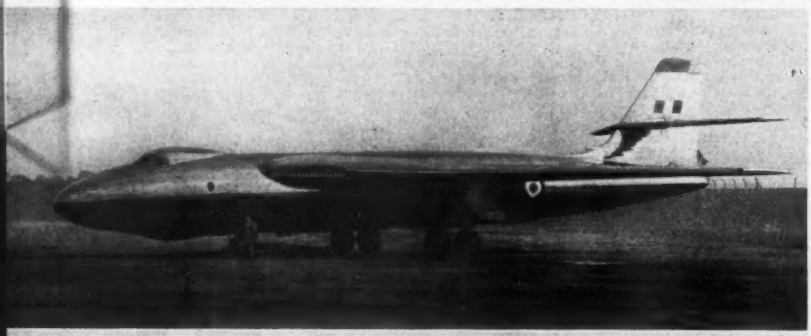
Mr. H. T. Chapman, whose new post is announced here, alongside a Sapphire production line in the works at Coventry.

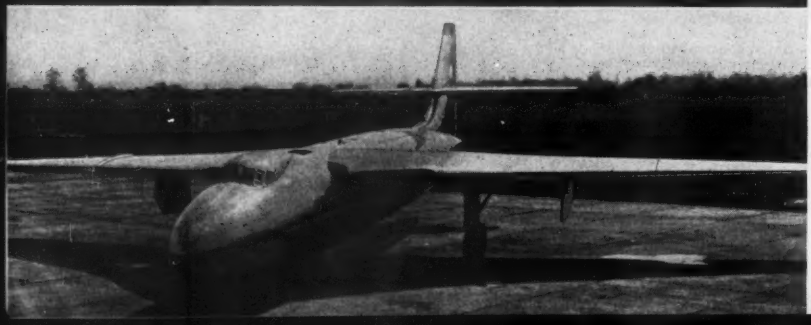
Growing Impetus

NEWS of expansion in the industry to meet the increasing demands of the armament drive continues to flow in. In addition to developments mentioned elsewhere in this issue, a big acquisition of additional factory and airfield space by Hawker Aircraft, Ltd., is announced by Mr. Neville Spriggs. The Government has allocated the 1,500,000 sq ft factory at Squire's Gate, Blackpool, where Hawkers will also have use of the airfield. In addition, since their present airfield at Langley, Bucks, is inadequate—and too close to London Airport and Northolt—for use by jet aircraft, they are to share Dunsfold, near Godalming, Surrey, with Skyways, Ltd., the charter company which has been operating there for some time past.

Work at the Hawker factories at Kingston and Langley will continue. The new moves were contemplated some eighteen months ago, then postponed when the air re-armament programme was temporarily slowed down.

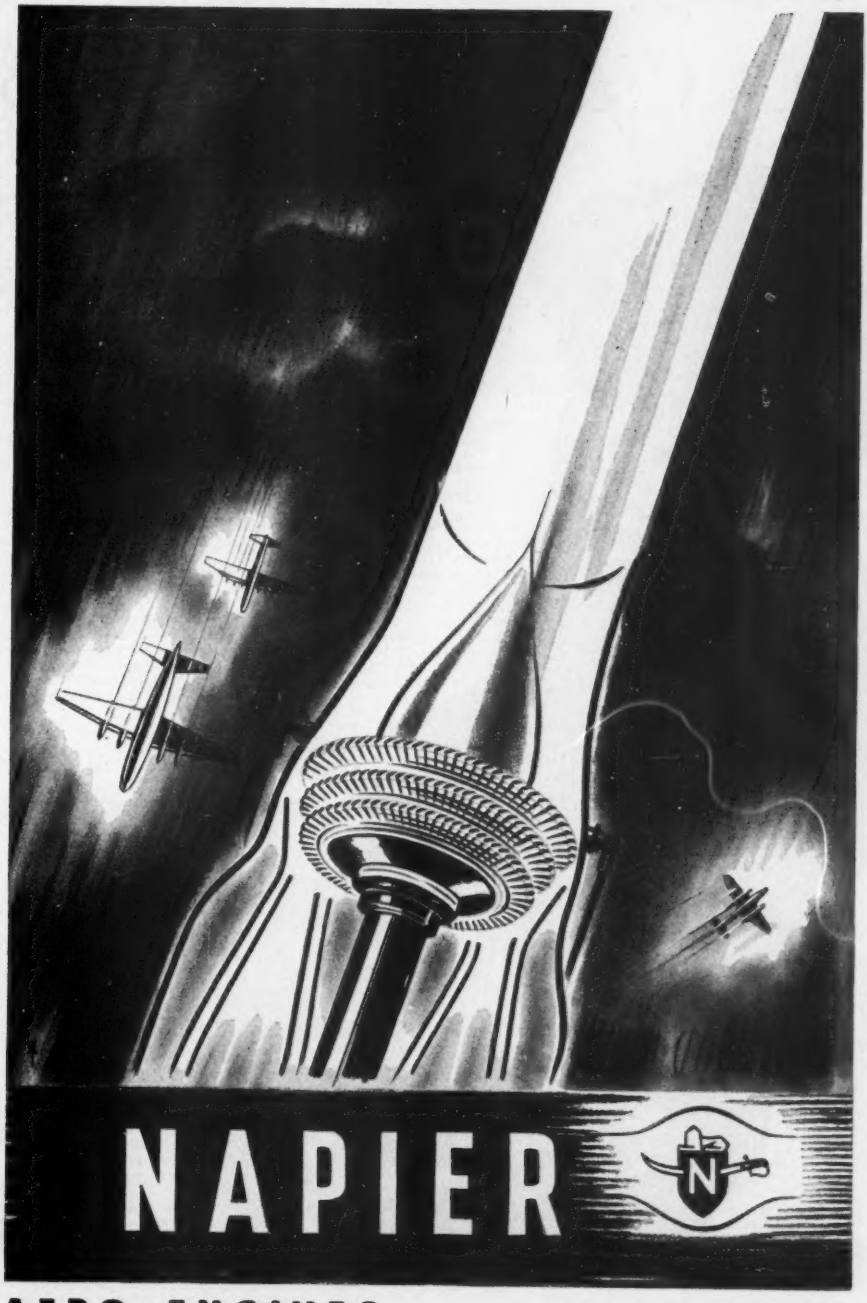
Another acquisition, this time in the components field, is that of the Coventry Precision Engineering Company's Earlsdown, Coventry, factory by Dowty Equipment, Ltd. Purchased from the present owners, Tecalemit, Ltd., it will be used mainly for production of gas-turbine fuel pumps and systems. Dowty have also signed an important agreement with an American firm, Thompson Products, Cleveland, Ohio, for the production of Dowty systems under licence; they are to be made there for the American-built Armstrong Siddeley Sapphires.





Airborne May 18th—
THE VICKERS 660

WE have no doubt that in the years to come scores, if not hundreds, of pictures of the Vickers 660 will appear in the pages of "Flight". The greater interest, therefore, attaches to these first-released views of this most impressive aircraft—Britain's first four-jet bomber. The first flight of the 660 was made at Wisley on May 18th by Capt. J. Summers. "A substantial order" has been placed for the R.A.F.



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GUST ALLEVIATION

Experiments by Boulton Paul Aircraft, Ltd.

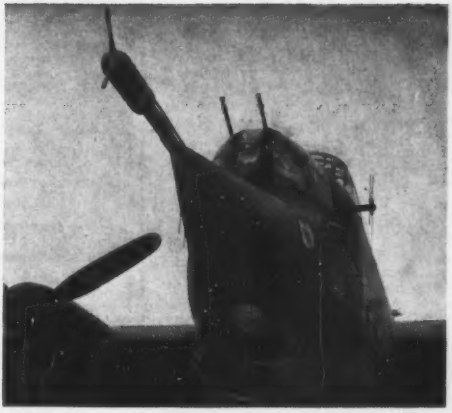
THE problem of gust alleviation has been under study for some time by Boulton Paul Aircraft, Ltd., and a gust-alleviation device developed by the company is now undergoing preliminary trials in a Lancaster.

At the risk of reiterating familiar facts, it may be pointed out that in turbulent air an aircraft is liable to be bumped more or less violently up or down, according to the strength and direction of the gusts encountered. Not only does this cause physical discomfort to passengers and crew, but heavy loadings are momentarily imposed on the structure—especially on the wing—and in modern aircraft these loads frequently constitute the worst stressing case by which the strength of the wings is determined.

The successful outcome of trials now being conducted with the Boulton Paul device will, it is claimed, enable the technique to be applied to lighten wing structures and thus increase disposable load, improve passenger comfort and at the same time provide a greater degree of protection against the effects of severe gust forces. Relief from critical gust loads should restrict wing stresses to a range well within the fatigue limits of the materials used, and so make a valuable contribution to the useful life of aircraft structures.

In the Boulton Paul system an electro-manometric transducer mounted at the nose of an aircraft detects vertical components of gust pressures (termed gust signals) which constitute a demand for symmetrical displacements of the ailerons if level flight is to be maintained. After suitable amplification, the difference between the gust signal demand for aileron and the actual aileron position in relation to the gust is converted to a mechanical displacement. This operates on the input to a Bouton Paul electro-hydraulic power control unit and superimposes the required gust correction on the ailerons independently of the normal control by the pilot.

If adequate alleviation is to be achieved, the aileron correction must be applied at the instant at which the gust acts on the wing



Electro-manometric transducer experimentally installed in a Lancaster

structure. It follows, therefore, that a suitable time delay is required between detection of the gust signal and operation of the ailerons to correct for the gust. The time required (of the order of 1/10 sec) is a function of the distance between the gust-detecting device and the wings, and of aircraft speed. In the experimental installation, provision is made for varying the transmission time of the whole system in relation to dynamic air pressure, so that the behaviour of the aircraft may be studied under varying conditions of speed and transmission delay. Future systems will probably incorporate automatic transmission delay correction to compensate for variations in air speed.

The incorporation of gust alleviation in the experimental Lancaster has required only small variations in operating controls and flying drill. The chief additional control is a lever operating through a gate which allows the pilot to select "manual," "power," or "gust" operation.

FOKKER S.13 in the Air (Continued from page 609)

Of the normal type of landing it may be said that the S.13 has a fairly steep approach with excellent forward view, and as speed is reduced over the hedge it assumes its touch-down attitude and may be left to fly on without fear of bouncing. I have seldom had to do less to achieve a smooth arrival on a runway.

Trim changes on lowering wheels and flap are not very pronounced, and practically cancel each other out, so there is little call to be working the wheel on the late part of a circuit and landing. For the same reason, full power can be used on an overshoot without heavy stick-loads being experienced.

A comfortable approach speed is 100-110 m.p.h. for the turn on finals, with flap added to taste. The control permits inching down as required and, as mentioned previously, a small aerofoil section on a dial indicates the actual flap position relative to the wing. A fair amount of power is desirable to keep the rate of descent correct as speed is reduced to 85 m.p.h., with additional flap lowered, on the later part of the approach. Touch-down speed is about 70 m.p.h.—varying slightly, of course, with weight.

Before leaving this latest-but-one Fokker product (a brief progress report on the Derwent-powered two-seat jet trainer, designated S.14, was made last week), it may be mentioned that a particularly neat control-locking device has been devised. If the rudder is centralized an arm can be raised from its clip on the cabin wall beside the first pilot and attached by spring-loaded pin to a lug in the wheels. The brakes must also be applied, and are locked together with the controls. One simple up or down movement of the locking arm thus takes care of all the controls.

Performance figures have been calculated for a floatplane version of the S.13 and for landplane versions with Alvis Leonides 502/1 and Renault 12SO2 engines. With Leonides, the aircraft's maximum speed is reduced by approximately 9 m.p.h., while the cruising speed remains the same. The rate of climb to 3,000ft takes half a minute longer, and the ceiling is reduced by 650ft. The total weight is some 700 lb less. So far as the Renault version is concerned, the performance figures are very similar to those with the Leonides; a.u.w. is about the same as with the Wasp.

DATA FOR THE FOKKER S.13 TRAINER
Two 600 h.p. Pratt and Whitney Wasp S1H1-G Engines

Weight empty	9,225 lb (4,185 kg)
All-up weight	12,735 lb (5,775 kg)
Wing loading	25.7 lb/sq ft (125 kg)
Power loading	10.6 lb/h.p. (4.8 kg)
Max. speed at 8,000ft (2,440m)	220 m.p.h. (355 km/hr)
Cruising speed at 11,800ft (3,600m)	199 m.p.h. (320 km/hr)
Landing speed	69 m.p.h. (111 km/hr)
Climb to 3,300ft (1,000m)	2.7 min.
" " 9,900ft (3,000m)	9.2 min.
Service ceiling	21,300ft (6,500m)
Ceiling on one engine	8,500ft (2,600m)
Take-off run, runway, 5.5 m.p.h. wind	1,000ft (300m)
Max. range, full tanks (270 gal)	1,200 miles (2,000 km)

Floatplane version: Max. a.u.w., 13,300 lb; cruising speed, 174 m.p.h.; climb figures, as above; max. range, 930 miles.

DERBY'S DISPLAY

DISTINGUISHED visitors from France were among the 12,000-odd spectators at the Derby Aero Club's Flying Display which took place last Saturday, May 19th. They included General Stehlin, Deputy Chief of the French Air Staff, Col. de Roncourt, French Air Attaché, and his assistant Col. Derimay, together with A.V-M. R. George, Air Attaché in Paris, and M. Jacques Allez, president of the Aero Club de France. From London came Mr. Frank Beswick, parliamentary secretary to the M.C.A., together with G/C. and Mrs. Wilcock.

The display, which was efficiently presented and timed, included a demonstration of a Canberra, formation aerobatics by the French Patrouille d'Etampes, air drill by Meteor 4s of 504 (County of Nottingham) Squadron, R.Aux.A.F., and well-tried favourites such as S/L. Porteous' castering-undercarriage-Autocrat demonstration. In addition, the Harben Memorial Trophy Race was flown; it was won by F/L. J. Findlay. More will be said, in our next issue, about this event and the flying display.

HERE AND THERE

South, Midlands and North

IN London this Saturday, May 26th, the King is to present his Colour to the R.A.F. (Hyde Park, 3 p.m.); there will be a large-scale fly-past. At Wolverhampton, there is an air display (2 p.m.) and the Goodyear Trophy Race; and there is also a display (2.15 p.m.) at Woolsington, Newcastle.

Anthorn "At Home"

THE annual Navy Day and Air Display at R.N. Air Station Anthorn, near Carlisle, takes place on Saturday, June 2nd, starting at 1 p.m.

Fokker Jet Flies

THE Fokker S.14 jet trainer, illustrated last week, made its first flight on May 20th. Undercarriage trouble obliged Capt. Sonderman to make a belly landing, but repairs should take only a few days.

U.S.A.F. in G.B.

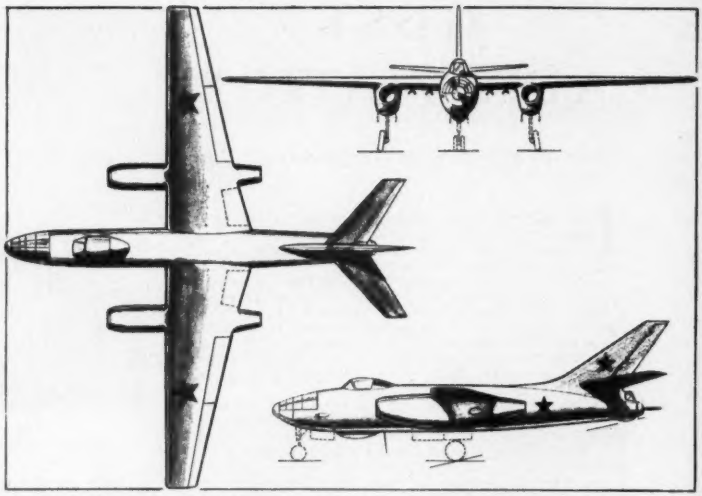
THE Third Air Division of the United States Air Force, reformed at Marham in July, 1948, has recently been raised to the status of an Air Force. Major General Leon W. Johnson continues in command. A new Air Division—the Seventh—is being set up, with headquarters at South Ruislip, alongside the H.Q. of the Third Air Force. This Division is commanded by Maj. Gen. A. J. Old.

National Air Races Addition—

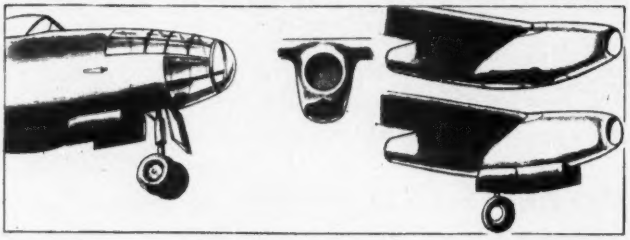
A WELCOME addition to the two aircraft entered for the S.B.A.C. Challenge Cup contest in the Festival of Britain 1951 National Air Races (see *Flight*, May 18th) is a Vickers-Supermarine Attacker F.1 (Nene 3), entered by the makers and to be flown by D. W. Morgan. It will also compete in the R.Ae.C. Jubilee Trophy Race.

—and Subtraction

LESS good is the news that Nat Somers, winner of the King's Cup in 1949, will be unable to compete this year. He is at present laid up at his home with what is in effect a broken neck: the bones have become displaced but Somers has no idea of the cause of the trouble; he has had no mishap likely to cause such an injury. Treatment is expected to last at least another two or three months.



REVISED IMPRESSION of the new Soviet twin-jet bomber, formerly illustrated in "Flight" of May 4th. The correspondent responsible for both drawings now reports that there are twin guns in the tail; two fixed forward-firing guns; "rocket" carriers under the inboard wing panels, and a blue-painted fairing under the fuselage, in the position shown. Undercarriage arrangements are illustrated below. Reference to Soviet types in use in Germany is made on this page.



Canberra For Australia

THERE is no confirmation of a reported statement by "a senior Air Force officer in Brisbane" that a flight of English Electric Canberra jet bombers would "shortly" arrive from England. One Canberra, however, should be delivered before many weeks have passed.

Ferried to Ferry

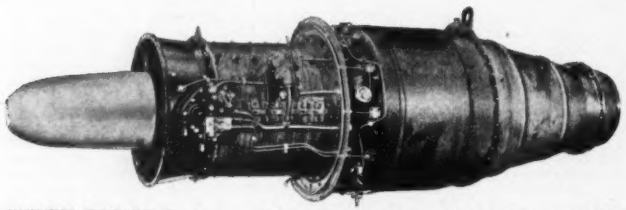
THE two Airwork Freighters which left Blackbushe recently to operate the Cook Strait (N.Z.) ferry service reached Blenheim, South Island, last Saturday, after flying for 13 days in formation. Neither was fitted with an automatic pilot, and for this reason the flight is to be considered something of a feat. The operators do not consider the fitting of automatic pilots justified for the 70-mile ferry duties. The Freighters may be in service next month. It is expected that 15,000 tons a year will be carried initially, increasing to 25,000.

Russian Types in Germany

IT is reported that all Russian fighter squadrons in Eastern Germany are now equipped with Mig-15 jets. The new twin-jet bomber, as illustrated on this page, is also present in some numbers, but attack squadrons continue to use Il-10s and piston-engined fighters. Co-operative training by Mig-15s and Il-10s has been observed, as have B-25 Mitchells.

Automatic Insurance

A SLOT-MACHINE to provide travellers with insurance cover is among the exhibits at the British Insurance Association's exhibition, open for the Festival season at Lloyd's, London. Similar machines may presently be installed at airports, offering a £2,000. 24-hour policy for 4s. Apart from its many notable historical exhibits, the exhibition illustrates the whole field of modern insurance; it also explains the working of Lloyd's shipping-register system, which is ultimately likely to be extended to the world's airlines. There is, too, a model of H.M.S. *Implacable*, the carrier "adopted" by Lloyds.



SIMPLIFIED TURBOJET: The Armstrong Siddeley Viper turbojet may be described as a simplified version of the Adder, which in turn has much in common with the Mamba turboprop. The compact nature of this 1,500 lb thrust turbojet may be gauged from this first photograph to be released. Vipers are to be installed in production versions of an Australian pilotless aircraft.

Wilbur Wright Lecture

MR. A. E. RAYMOND, of the Douglas Aircraft Corporation, is to deliver the 39th Wilbur Wright Memorial Lecture before the R.Ae.S. on September 10th; his subject will be announced later.

Not So Fantastic

IT is reported that in five years the membership of the British Interplanetary Society—once regarded by many as something of a "crank" organization—has grown from 270 to 1,200, and that new members are joining at the rate of 70 a month. The possibilities of space travel by rocket are, of course, the Society's chief interest.

Stepping Up

TO allow more capacity for their production of jet fuel-system components, Joseph Lucas (Gas Turbine Equipment), Ltd., are shortly to take over the Broadgreen, Liverpool, works of Elexcel, Ltd., a subsidiary of the Automatic Telephone Co. They will operate the factory on behalf of the Ministry of Supply.

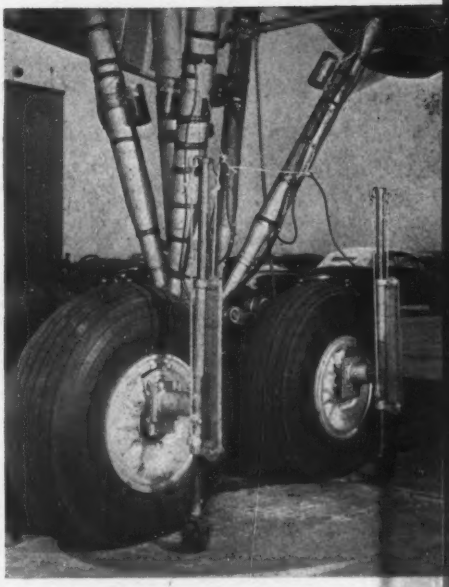
Twin-Jet Racer

CENTRE-PIECE of the Fouga stand at the 19th International Aeronautical Salon, opening in Paris on June 15th, will be the Lutin twin-jet *avion de competition*, capable of 500 km/hr (310 m.p.h.). At le Bourget, in company with the jet-powered Cyclope II and Gemaux I, will be a CM. 101R piston-engined transport, having two auxiliary Piméné turbojets.

Airmet's Appeal

THE 21,500-signature petition for the restoration of the Airmet weather service is shortly to be presented to the Government. Of the total number of signatures, 4,370 are from people with aviation interests and 5,898 from agriculturists. Delivering the presidential address of the Royal Meteorological Society last week, Sir Robert Watson-Watt, retiring president, made a strong plea for the restoration of the service in a redesigned form.

DROPPING A PACKET: Fairchild have recently been flight-testing a new four-wheel-bogie undercarriage for the Packet, making use of the impact-measuring attachments seen here. Strain-gauges transmit readings to oscillographs carried in the hold.



Prestwick Display Cancelled

AS a result of various complicating factors which have arisen, the Soldiers', Sailors' and Airmen's Families Association air display at Prestwick, fixed for July 7th, has been indefinitely postponed.

Aid for France

TWELVE Thunderjets, the first of this type to be received under the U.S. aid programme, were handed over to the French Air Force at Rheims on May 17th in the presence of General Eisenhower. France has so far received about 120 fighters and light bombers, plus an undisclosed number of B-26 Invaders delivered direct to Viet-Nam.

R-R. Scottish Production

EXECUTIVES of Rolls-Royce, Ltd., have arrived in Glasgow to discuss the preliminary plans for the new engine factory at East Kilbride. It is hoped that the plant will be ready for production within a year. It is estimated that the 3,500 workers will eventually be employed. Rolls-Royce have also leased smaller factories in adjoining areas.

Aeronautical Influence

OPERATED by a 900 h.p. vee-twelve Fiat engine, a 150 m.p.h. wind tunnel of 8ft 6in working diameter is in use at the Mandello, Italy, works of the Moto-Guzzi company for windage tests on racing motor cycles. As well as the usual balances for measuring resistance, the aeronautical wool-tufting system is used, on both machine and rider, to show the breakaway of airflow. A description of the test methods employed appears in the May 17th issue of our associated journal *The Motor Cycle*.

NOT PRESS DAY in "Flight" offices, but U.S. airmen dumping surrender leaflets from a Dakota of the U.S. 374th Troop Carrier Wing over Korea. The slipstream causes some of the leaflets to fly around as the bundles are pushed out of the open hatches.

IN BRIEF

IT is reported from Toronto that Russell Industries, Ltd., will spend $1¼ million on capital expansion this year, of which $1 million will be for a new plant devoted to aircraft gearbox production.

* * *

Mr. E. S. Pearse, A.F.R.Ae.S., A.M.I.Prod.E., who was at one time senior sub-contracts manager at Vickers' Weybridge works, and was subsequently with the Hunting group, has been appointed works manager of Quickfit and Quartz, Ltd., Stone, Staffs, manufacturers of laboratory and industrial glassware.

MR. A. HILLIER, O.B.E., F.C.I.S., A.F.R.Ae.S., who has completed 35 years' service with the Sperry Company. His colleagues have presented him with an oil painting of himself.

Mr. A. G. Brownsill has been appointed London manager of the Goodyear aviation service division. His duties will largely be at London Airport and at Northolt, where he will have an office. Goodyear disc brakes, it may be recalled, are in use on B.O.A.C. Argonauts.

* * *

The B.B. Chemical Co., Ltd., Leicester, commenting on Mr. H. Povey's R.Ae.S. lecture on Comet construction methods (*Flight*, April 27th) wish it to be known that the Bostik solutions referred to by the lecturer were special adhesives and sealing compounds prepared for the particular job mentioned.

THE BOMBER'S FUTURE

Pathfinders Hear Some Authoritative Opinions

REFERENCE was made last week to the recent annual Pathfinder dinner at which a number of senior Royal Air Force officers were present. Because of the keen interest in, and concern for, Bomber Command which is still felt by many wartime Pathfinders, speeches indicative of present Air Force policy in connection with Bomber Command were of particular interest.

The first guest speaker on the occasion was, appropriately enough, General Johnson, U.S.A.F., who began by pointing out that whatever might be one's feelings on the subject of war and defence, the weak did not survive in a storm. He then went on to talk of the growing co-operation and strength of Anglo-American air power. The General said that he had to be careful not to ask too much of the Royal Air Force on behalf of the American Forces in this country, because everything possible was given. (It may be mentioned here that the American Third Air Division is now known as the Third Air Force, and General Johnson is its commanding general.)

Air Marshal Sir Arthur Sanders, Deputy Chief of the Air Staff, who was the next speaker, talked first of Bomber Command in wartime, paying a well-deserved—though, in the past, seldom-vciced—tribute to the administrators of the Command. (He himself, it may be remembered, was Sir Arthur Harris's "head housekeeper" between 1943 and 1945.) Then, making what may be regarded as an official statement on the subject, the D.C.A.S. said that although a superficial impression might have been given that fighters were the Air Staff's only responsibility, this was not so. Bomber Command was not being neglected, and the offensive-defensive policy was still as strong as ever. With its present aircraft Bomber Command was not fully capable of strategic bombing in the true sense. With the expectation of a long period of peace, and with U.N.O. to help insure it, the decision had been taken after the war to build no more piston-engined bombers for immediate replacement of existing types, and when possibilities of war loomed up again it was too late to change that policy. With American bomber and atom power in mind, a short-term policy was adopted for increased production of fighters. Now there had again been a change; more money was available; and jet bombers—four-jet prototypes—were being built and would soon fly. They would be outstanding in performance but very costly, and thousand-bomber raids were probably a thing of the past. Not too far ahead, said Sir Arthur Sanders, we should be back in strategic bombing again "in a big way," and this would be a great deterrent to any aggressor. In the meantime, the Canberra could do much, whatever task it might be set.

Air Marshal Sir Robert Saundby gave a masterly survey in most concise form of the use of air power in wartime. First he mentioned the importance of getting through the almost inevitable defensive phase so that democratic countries could get geared up to win a war. Bomber Command did a remarkable thing after the Battle of Britain: it did not lick its wounds, but went over to the offensive and carried the war into Germany. Two years of uphill offensive by Bomber Command made Hitler decide to turn a great part of his resources to fighter defences. The year 1943 brought strategic night and day bombing through which the might of Germany was largely destroyed; then came the preparation for invasion, and the Air Force spearhead had been the Pathfinder Force.

He recalled that there had been a fear of over-weakening the main bomber force by "creaming-off" the best of its crews, for the Pathfinder Force was at first composed of these unusually capable and proven crews; but, the risk having been taken, the remainder of the main-force crews had proved to be good enough also. The whole of the main force of the Command came to depend upon the P.F.F. Though 50,000 were killed and missing in Bomber Command, morale never wavered.

Air Marshal Sir Hugh P. Lloyd (since promoted to Air Chief Marshal), replying to the toast of "Bomber Command," said that it owed much to Sir Robert Saundby. To-day it was aware of its tremendous tradition and had faith in itself. The Maginot mentality was as dangerous in the air as on the ground, and the bomber was a weapon of defence as much as the fighter or the anti-aircraft gun.

Bombing to-day was as good as ever, but there were too many built-in errors in the present equipment. For visual bombing at 450 knots from 45,000ft it was necessary to see the target 35 miles ahead.

Sir Hugh then used a phrase that may well become a slogan of the Command—"The modern bomber is a rapier, not a bludgeon." If one halved the bombing error, he went on, one achieved four times the effect, or conversely, 75 per cent of the force could be scrubbed while achieving the same result. The business of "putting a bomb on a pin" was a soluble problem to-day, provided three things were available: money, scientists, and a priority. The answer was radar bombing with a different launching technique, and the ideal bomber would be one which at any time could find its own target without outside aid. There were, of course, tremendous technical problems. For example, the Lancaster carried 160 (radio and radar) valves and a modern four-jet bomber would have between 600 and 700. It was a pretty devastating thought that, if one of these failed, a sortie could be abortive after a 2,000-mile flight to the target.

The final speaker was Dr. J. C. MacGown, Pathfinder president, whose speech on a variety of subjects delighted everyone. He said that a definition of insanity was the inability to face the reality, and of pacifists he said, "We are all pacifists, but not insane." He spoke of the spirit of adventure which never leaves aviators, and recalled that quite recently Marshal of the R.A.F. Lord Trenchard flew in a Meteor 7. On a more sombre note, he made reference to serious and obscure genetic diseases which resulted from the effects of atomic bombs.

Saro Design Deputy

FROM Saunders-Roe, Ltd., comes news that M. J. Brennan, B.Sc., A.M.I.Mech.E., A.F.R.Ae.S., has been appointed their deputy chief designer. Born at Muswell Hill, London, in April, 1913, Mr. Brennan was educated at St. Mungo's Academy and Glasgow University, from which he graduated in April, 1934. In the same year he joined the technical office of Hawker Aircraft, Ltd., where he remained until 1936, when he went to Saunders-Roe. He was engaged in the stress office, the aerodynamics office and the project office. Since 1947, he has been technical assistant to the chief executive, Sir Arthur Gouge. Last January, when Saunders-Roe took over the development contract on the Skeeter and Air Horse helicopters, Mr. Brennan took charge of that section. He has practical flying knowledge, having qualified for an "A" licence in 1931.

Mr. M. J. Brennan

Il-10 Flying in U.S.A.

A RUSSIAN-BUILT Il-10 ground-attack aircraft captured at Kimpo airfield near Seoul, Korea, several months ago, has been flown at a U.S.A.F. base. A two-seater, it is said to have a top speed of 280 m.p.h. and a cruising speed of 210 m.p.h. Armament consists of two cannon and two machine guns in the wings, and a cannon in the dorsal position.

Hoover Appointments

FOLLOWING the recent announcement that Mr. W. Puckey, director and general works manager of Hoover, Ltd., had been seconded to the Government to fill the new advisory post of Deputy Controller of Supplies (Air), certain changes have been made among the firm's executives. They include the appointment, until Mr. Puckey's return, of Mr. B. H. Dyson as deputy works manager to supervise the production side of Hoover factories in Britain.

Early in his engineering career, Mr. Dyson was with the Fairey Aviation Co.: he was actually their first jig and tool designer, and was responsible for one of the first automatic riveting machines to be used on seaplane floats. He also worked with German engineers on an early dynamic-balancing machine for airscrews.

Mr. W. J. Dimmock, who has been appointed works manager of the Perivale factory, was responsible for the headquarters organization of production plant in the 18 Hoover war factories, many of which were engaged on aircraft work.

. . . . there are people who

think the flying boat can never

equal the landplane

in performance

. . . . *how wrong they are!*

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T. E. LAWRENCE AND THE R.A.F.

Individualist Under Discipline: Thoughts Prompted by Books by and about him

By Wing Commander R. C. O. LOVELOCK, D.F.C.

"Aircraftman Shaw" on one of his powerful 1,000 c.c. Brough Superior motor cycles, a succession of which he owned. Note the uniform of the period, with high collar and puttees.

IT is, perhaps, a truism to say that the name of T. E. Lawrence ("Aircraftman Shaw") has become almost legendary in British politico-military history; yet to too many of the younger generation it remains as little more than a name. We feel that our publication of this article will not be unrewarded if it serves to arouse in readers a new curiosity as to the life of Lawrence and an inclination to seek out and read the works which W/C. Lovelock quotes; a bibliography appears at the end of his contribution.

THOSE admirers of T. E. Lawrence in both literature and action who have had R.A.F. experience themselves have been disappointed that *The Mint*, originally expected in 1950, cannot yet be generally published; but some extracts from it have recently been included in a first anthology called *The Essential T. E. Lawrence*. If these extracts are read with the better known *Letters of T. E. Lawrence*, they give us an interesting view of his reactions to peace-time service in the much-less-complicated R.A.F. of nearly thirty years ago, more especially when seen in conjunction with his many remarks on regular armies in the unabridged version of *Seven Pillars of Wisdom*.

Lawrence served in the ranks of the R.A.F. from 1922 to 1935, with the exception of two years (1923-25) spent in the Royal Tank Corps. He enlisted under the assumed names of Ross and later Shaw, formally adopting the second by deed poll in 1927. On completion of the recruits' course at Uxbridge, about which *The Mint* was written, he was posted to Farnborough; but undesirable publicity then caused his discharge, so that he turned to the ranks of the R.T.C. at Bovingdon, Dorset. After reinstatement in the R.A.F., he was posted first to Cranwell and then to British India, serving at Karachi for eighteen months and at Miranshah, a fort in Waziristan on the North-west Frontier. Whilst he was at Miranshah in 1929, some internal strife in Afghanistan prompted the Soviet government to make protests (which were quite unfounded) that he was engaged on Secret Service work in that area, so Lawrence was posted home to dispel the rumours. He spent the rest of his service among flying boats and marine craft, at Mount Batten, Plymouth, and in shipwrights' yards. It had been hoped that after his discharge he might be prevailed upon, as a civilian, to undertake some work of national importance more in keeping with his great gifts, but in May 1935, during his forty-seventh year, he was killed in a motor-cycle accident only a few weeks after his release.

No doubt the glib jargon of psychology, with its facile conclusions, could be freely used to "analyse" the perversity which caused Lawrence to submerge his fine intellect in the ranks, but there are many simpler reasons which are quite logical and probable. It seems to have been as a refuge from exhaustion and responsibility that he embraced the inexorable determinism of an aircrafthand's life, for in the Arab Revolt and the years immediately following it he had spent himself to the utmost, physically, spiritually, and mentally. During those two years in the desert the unbelievable privations he had endured were set amid seasonal and climatic extremes more severe in their contrasts than anywhere in the world; to the known strains of guerrilla war, with a price of £20,000 upon his head, and of being wounded in action many times, had been added the lasting effects of fever, disease, and of hideous maltreatment.

Spiritually, the survival of the Revolt had depended so much upon his own faith in the destiny of the Arabs.[1] In his own words he had meant to make a new nation, to restore to the world a lost influence; and to do it he had gone down into the dust and noise of the Eastern market-places and made others see his visions coming true. His heart had been broken when the growing suspicion that he had unknowingly deceived the Arabs in the British name was confirmed by the publication, whilst the fighting was still going on, of two plans for the disposal of Arab territory after the war. The first was the Sykes-Picot Agreement, prematurely and deliberately exposed by revolutionary Moscow in 1917, by which the more desirable parts of Arab Asia were to be divided into French and British spheres of influence; and the second was the Balfour Declaration, offering the Jews a national home in Palestine. Although he had not lost his power to win men's hearts, his disillusionment had been deepened by his inability, as Feisal's advocate, to sway the subsequent peace conferences on Arab independence.

Being then determined that the aims and achievements of the Arab Revolt should not be lost to history and the world, he had set them down at white heat, with all the immensity and grandeur of his prose, in *Seven Pillars of Wisdom;* when the first manuscript was stolen, he had re-written the enormous work of 330,000 words from memory, driving that fine brain in great surges of creative and recollective effort from which it had never properly recovered. Perhaps, too, a private grief concerning the mysterious personal loss which forms the theme of dedication, in verse, to *Seven Pillars* may have contributed to his desire for renunciation, as might also his admiration for the Arab ability to eschew privilege, about which he had written: "they taught me that no man could be their leader except he ate the ranks' food, wore their clothes, lived level with them, and yet appeared better in himself."[2] It seems that the dictates of his conscience, which made him refuse all honours or payment for his service in Arabia or profit from his writings thereon, may

T. E. LAWRENCE AND THE R.A.F. . . .

also have forbidden him to reap any advantage from his name or reputation when taking employment; but whatever his secret, we can rejoice that he kept it well.

What is of greater interest to us is why he should have joined the R.A.F. It is true that his valuable experience, though on a small scale, of air co-operation in war had made him aware of the possibilities of air control; on account of this he had supported Lord Trenchard's advocacy of the scheme for Iraq and other mandated territories in the Middle East. There may also have been a sentimental reason, in that he had lost a brother in the Royal Flying Corps. Probably the factor which had more influence upon his choice than any other, however, was that he had such a profound distrust of orthodox military training and, having decided on ranker service, saw in the newly formed R.A.F. an opportunity for it to be unhampered by older traditions. To him the R.A.F. seemed imbued with a spirit of readiness and vigilance combined with the desire for new horizons of influence in peace and war; he was "on fire with the glory which the air should be."[3] Yet blindly he seemed to imagine that, since its ranks were composed of technicians who must be held personally responsible for their work (and who were therefore more individualistic than infantry soldiers), the R.A.F. would evolve a suitable discipline for itself to replace older and less appropriate forms. It is evident that he was not unaware that there were special difficulties inherent in the R.A.F. structure, for he wrote to John Buchan as late as 1928 that "the R.A.F. has not yet found the way out between the rocks of discipline and individual intelligence."[4] Yet in spite of his tremendous military knowledge and the fact that he was a model of punctilious discipline himself, he often complained bitterly in private letters that R.A.F. domestic life was founded upon basic military law. Of course, he did not enter the R.A.F. either to study it or consciously to improve it, and the letters were written in many moods; but he might almost have been the originator of the oldest and most illogical of false maxims—that an airman will do anything for his aircraft except guard it with a rifle. Swagger canes, compulsory church parades, breeches and puttees, kit inspections, and the incursions of the orderly officer; all were attacked and generally described as being twenty years behind in matters of common decency, and as having been designed for the immature.[5]

Lawrence on Discipline

Undoubtedly, regular airmen of that time, as now, were of a high standard, and, unlike most private soldiers, had entered their Service for a career. The devotion they felt for their aircraft, as far as it went, is the earliest and best of all R.A.F. traditions, but the cohesion stimulated by being at grips with an untrustworthy natural element has never proved quite sufficient to permeate every moment of air-force duty in the same way that it is evident in naval duty aboard a man-of-war. Duller methods are necessary to solve those air-force problems which are not actually aeronautical. In spite of being technicians and not normally combatant, air-force troops are ground troops and must be kept mentally aware that one day, no matter how unlikely the event, they may have to defend an airfield and its equipment against enemy forces, and must therefore be trained as infantry in order to be able to do their share of fighting, with a stiffening, perhaps, of proper combatant ground troops. Yet Lawrence could write, with mischievous irresponsibility, at a time when there was not even the R.A.F. Regiment, "discipline itself is not necessary, we fight better without it."[6] With his background he must have known that what he calls "the restrictive"[7] in the discipline of all arms-bearing troops is not, like battle training, intended directly to improve their ability to fight; that there is another, equally important, side to discipline. At Tafas, in Syria, he and his Arabs had seen the frightful results of deeds perpetrated by a demoralized Turkish army in rout: deeds which led to that army's eventful annihilation.[8] They had admired, in contrast, the behaviour of a column of Germans and Austrians who, though thousands of miles from home and with their war lost, had remained faithful to their military ideals until the end.[9] This is the other need—to ensure morale restraint in times of disorder, when the privations of the siege have given place to either the gluts of victory or the opportunities of retreat, and, as always, the means to riot and murder lie close at hand.

In less personal matters than these, however, Lawrence felt so strongly for the good of the R.A.F., that it ought to have been possible, without vulgarity, for him to have been one of its greatest assets in public relations for recruiting. Whatever the private motive of his enlistment may have been, his gesture could have been represented as a noble one, instead of his being regarded as a skeleton in the Air Ministry cupboard.[10] Fortunately Lawrence's sense of humour often allowed him to play the administrative machinery at its own cheerless game. A Tank Corps N.C.O. relates how, soon after his enlistment at Bovington following the Farnborough "scandal", Lawrence received a telegram from the Air Ministry requesting him to report there temporarily at once. It happened that for a small domestic offence as a recruit he was "confined to barracks" at the time; so, instead of informing his new commanding officer that he had been summoned by a Ministry, he wired back with great relish "unable to comply with request as am a defaulter."[11]

Years of Adventure

Those were the years of the Schneider Cup, and of R.A.F. participation in expeditions to Everest and to Greenland, as well as a more thrifty and humane Pax Britannica, with its strength in the air, over the mandates in the Middle East—activities which combined to bring to the new service those idealistic Elizabethan enthusiasms which are so valuable in our national life. It was also the era of the first world flights on route-survey, and in July, 1929, we find Lawrence petitioning Lord Trenchard to divert the airship R.101 from her proposed route to Karachi to allow her to pass over Rub' al Khali, the then untraversed "Empty Quarter" of Arabia.[12] To the Secretary of State, Sir Philip Sassoon, he confided on another occasion that it was his ambition to take part in one of the flying-boat cruises then being projected and write a log of it so that he could contribute to a new collection in the literature of travel, a Hakluyt of the air.[13] What a pity that his remarkable powers for observation and description could not have been used to relieve the dreariness of air-route books, like that sense of wonder and curiosity with which Mathew Flinders and other 18th century hydrographers seem to have set and illumined the style of the Admiralty *Pilots*. Lawrence's feeling for the air was not limited to the tasks of the R.A.F.; he could see much scope there for endeavour in other forms, for he recognized the peculiar British genius in handling the new medium.

His later years in the R.A.F. seem to have given him some relief from the torments of memory and conscience from which he had originally suffered, for although he had so successfully fulfilled his destiny in Arabia, he had seen and known almost too much for any man to bear. Through being associated with flying boats and the Schneider Cup floatplanes, he became interested in planing-bottom design for R.A.F. marine craft, and in the use and maintenance of these boats. His *Notes on handling the 200 Class Seaplane Tender* would do credit to a master mariner.[14] The manned, armoured, bombing-target craft owes its conception to him. The emblem of 204 Squadron, "A cormorant with wings displayed," was designed from a photograph submitted by Lawrence, although the motto which his scholarship devised had to be abandoned for a shorter one when the design enclosing R.A.F. crests became standardized.* In conclusion, it is gratifying and humbling to realize how much "T.E.L., who should sleep among kings"[15] was loved and respected by the decent generous men with whom he chose to spend more than twelve years of his life.

BIBLIOGRAPHY

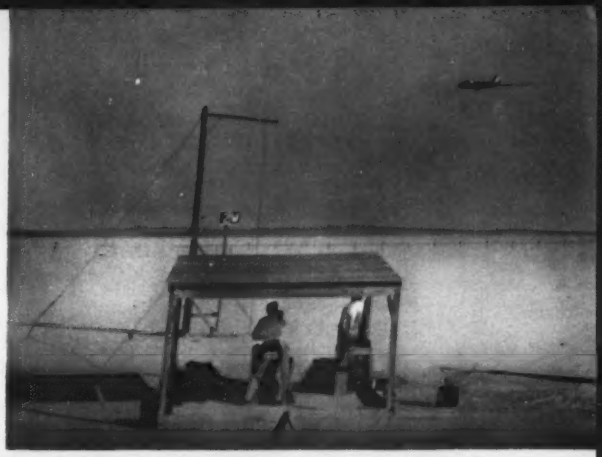
(1) "Letters", p. 262. (2) "Seven Pillars", p. 161. (3) Letters, No. 205. (4) Ibid., No. 367. (5) Ibid., Nos. 390, 424, 352, 353, 354. (6) Ibid., No. 414. (7) "Seven Pillars", p. 522. (8) Ibid., p. 652. (9) Ibid., p. 655. (10) "Letters", p. 363. (11) "T. E. Lawrence, by his Friends", p. 363. (12) "Letters", p. 389. (13) Ibid., No. 486. (14) "Essential T. E. Lawrence", p. 300. (15) Inscription on Lawrence's coffin (buried Moreton, Dorset).

*The present writer served in No. 204 Squadron from 1937 and helped to obtain advice on a new motto, at Mount Batten.

THE WORLD'S SPEED RECORD

Its History from the Earliest Days: An Opportunity for Britain to Regain It?

By H. J. COOPER



Record in the making: The F-86 (Maj. R. L. Johnson), holder of the present record of 670.981 m.p.h., being timed over the 3 km course at Muroc in September, 1948.

BEFORE 1905, when the Fédération Aéronautique Internationale was formed, there were no officially approved international aeroplane records: designers and pilots were more concerned with getting their machines into the air at all without bothering about outstanding performances.

But three years after Wilbur Wright first flew at Kittyhawk, simultaneously establishing distance, height and speed records, performances had increased sufficiently for a healthy spirit of competition to develop between pilots.

On its formation, the F.A.I. devised rules which had to be complied with before a performance in the air could be officially confirmed as a record. From time to time various amendments have been made to the rules and new categories introduced so that records have, in fact, become a useful measure of practical performance. Gradually the freak aircraft, built or modified solely to achieve a particular performance and having no useful purpose, has become less prominent in the official record list, and, in point of fact, the world speed record today is held by an aircraft which differs only in detail from its standard Service version.

The first records to be confirmed by the F.A.I. were set up by Alberto Santos-Dumont, a Brazilian aviation pioneer, who went to France to experiment with airships and aeroplanes. His records were for distance in a closed circuit and for speed, and were set up on November 12th, 1906.

These early records were not established in quite the same way as they would be today. To begin with, speed records up to 1909 were not flown over a course of any specified length; often the course coincided with the maximum range of the aeroplane making the attempt, which in some cases was not more than half a mile. By 1909 the range of aeroplanes had increased sufficiently for them to be timed over closed-circuit courses of 10, 20, 30 km and so on. Records were further divided into categories such as "pilot only" and "pilot and one passenger."

The first pilot to establish a world speed record at over 100 m.p.h. was the Frenchman Jules Vedrines, who attained 170.777 km/hr in his Déperdussin at Rheims on July 13th, 1912.

At the beginning of the 1914-18 war the speed record stood at 203.850 km/hr (126.67 m.p.h.). It had been set up by Maurice Prévost (who had won the first Schneider Trophy Contest in 1913) flying a Déperdussin monoplane powered by a 160-h.p. Gnôme engine. While the war was on no further attempts could be made, but it was evident that speeds and performances generally were greatly increasing. By the time manufacturers and pilots were able to resume sporting flying (in which category record attempts then really belonged), speeds had risen so much that a closed circuit was not considered suitable for recording the maximum speed, which could only be attained over a straight line course without any turning-points. The F.A.I. accordingly specified a one-kilometre course in a straight line, which had to be flown once in each direction, and the average speed of the two flights was accepted as the record speed. It was a condition that an aircraft making an attempt on the 1 km speed record should not land during the attempt, and had to make two safe landings shortly before.

With two exceptions, all world speed records from 1906 to 1912 had been accredited to France. Although Glenn Curtiss had set up a new speed record during the Gordon Bennett Race Meeting at Rheims in 1909, flying one of his own designs, the honour went to France, as at that time the record was credited to the country wherein the attempt was made. The first speed record credited to America was in fact made by a Frenchman, Henri Leblanc, who in 1910 flew his Blériot monoplane at 109.756 km/hr in New York. Now, of course, records are credited to the nationality of the pilot. At the end of the 1914-18 war the fastest aircraft was generally considered to be the B.A.T. Bantam, a British single-seat fighter biplane designed by Fritz Koolhoven and reputed to do 138 m.p.h., 12 m.p.h. faster than the pre-war record. But no official record was in fact established until 1920, when the Frenchman Sadi Lecointe flew a Nieuport 29 biplane at 275.264 km/hr (143 m.p.h.). The next eight records, made within two and a half years, were all held by French pilots. Lecointe was the first man to reach 200 m.p.h., which he did in September, 1921.

The kilometre course was the official distance for an absolute speed attempt for five years after the war. Then the F.A.I., at its annual conference held in Rome in October, 1922, decided to increase the course to 3 km so as to provide more accurate means of timing. This longer course had to be flown twice in each direction. Officially this rule did not come into effect until April 1st, 1923, although Lt. R. L. Maugham of the U.S. Navy, in his successful attempt on March 19th, 1923, flew over this longer course.

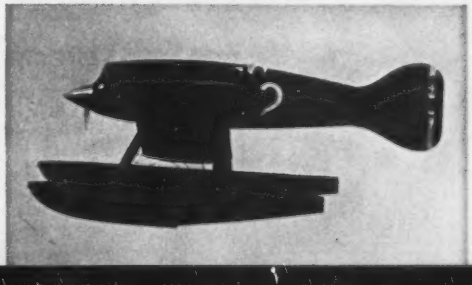
Great keenness developed in America with the production of the Curtiss Navy and Army racing biplanes, and at the St. Louis International Meeting in October, 1923, a duel developed between Lts. H. J. Brow and A. J. Williams to gain the highest speed. As soon as one of them beat the record the other managed to raise it still higher, until finally Williams flew at 429.025 km/hr on November 4th, 1923. After that the U.S. Navy Department prohibited high-speed flights as they considered that the limit of human endurance had been reached! They have since modified their opinion.

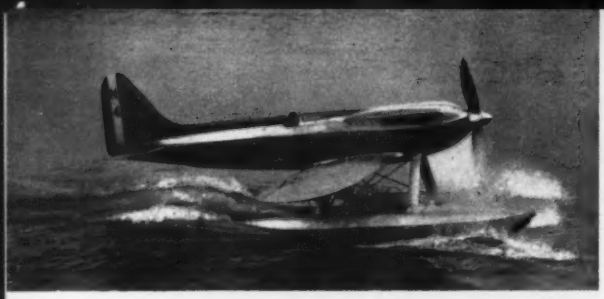
Successive records were so numerous that they were often beaten before they could be officially confirmed, and generally were not very much better than the previous records. At the F.A.I. Conference in Paris in January, 1924, it was decided that

(Left) The first pilot to achieve a world record at over 100 m.p.h.—Jules Vedrines, who flew at 106·5 m.p.h. at Rheims in 1912.

In the nineteen-twenties the record was successively held by a number of Schneider Cup seaplanes. On the right is Maj. di Bernardi's Macchi M.52, first aircraft to exceed 300 m.p.h.; this was achieved in an attempt in 1928.

"Flight" photographs





THE WORLD'S SPEED RECORD . . .

a new speed record would not be confirmed unless it exceeded an existing record by at least 8 km/hr (4.971 m.p.h.).

Up to 1924 the absolute world speed record had been held exclusively by landplanes, but as the maximum speed of aeroplanes in general increased, so correspondingly did the stalling speeds; and designers, worried about the high speed at which aeroplanes had to land, turned their attention to seaplanes as a means of providing a greater degree of safety when coming down. There were no lengthy runways then, and water provided much more room on which to manœuvre. The extra drag of floats was countered by increased horse-power and better streamlining.

But in fact, the absolute world speed record set up by a landplane—Adjutant Bonnet's 448.171 km/hr made on December 11th, 1924, in one of the Bernard racing monoplanes—was not beaten until 1927 when, for the first time, a seaplane established the absolute world speed record. The pilot was Maj. Mario di Bernardi, of Italy, who in a Macchi M.52 twin-float seaplane at Venice on November 4th, 1927, achieved 479.290 km/hr. Actually the 1927 Schneider Trophy Contest that year had been won by Great Britain, when F/Lt. S. N. Webster flew the Supermarine-Napier S.5 into first place at 453.282 km/hr—a speed faster than Bonnet's but not quite high enough to qualify, and in any case it was not made over the 3 km course. In that race di Bernardi had had to retire with the Macchi. Later he improved on his own record, and became the first man to fly at 300 m.p.h.

In a British attempt to regain the record in 1928, on November 4th, F/Lt. D. D'Arcy Grieg attained 519 km/hr in the S.5, but although this bettered di Bernardi's speed it did not exceed the record by the requisite 8 km/hr.

So—and this is not generally realized—Great Britain never held the official World Speed Record until 1929. When the next Schneider Trophy was held, at Calshot, F/O. H. R. D. Waghorn flew the Supermarine S.6 into first place at 528.879 km hr, giving Britain her second consecutive win and in fact surpassing di Bernardi's record. Afterwards F/L. G. H. Stainforth took up the Gloster-Napier IV and exceeded Waghorn's speed by achieving 541.2 km/hr (336.3 m.p.h.) over the 3 km course. Then S/L. A. H. Orlebar flew over the 3 km course at 575.700 km/hr (357.7 m.p.h.) in the S.6 and gained, for the first time, the absolute world speed record for Britain.

The record was next raised in 1931. F/L. (now A. V-M.) J. N. Boothman flew the Supermarine S.6b over the Schneider Trophy course at Lee-on-Solent at 548.45 km/hr (340.08 m.p.h.) and in so doing secured the Trophy permanently for this country. Under the rules of the contest the Trophy was to be won outright by any country recording three consecutive wins, and it now has a proud place in the Royal Aero Club. Boothman's speed, flown over a three-sided course, was not faster than Orlebar's speed over the straight course in 1929, but on September 13th, Stainforth took up the S.6b and established a new world speed record of 610.01 km/hr (379.05 m.p.h.) over the 3 km course, and later—on September 29th—increased it to 655 km/hr (407 m.p.h.). He was the first man to fly at 400 m.p.h.

For the 1931 Schneider Trophy contest Italy had been preparing a new Macchi seaplane, but had been unable to complete it in time. But two years later this aircraft captured the record. The new seaplane was the Macchi-Castoldi M.C.72 which, flown by W/O. F. Agello, attained 628.078 km/hr. In 1934 Agello again raised the record by flying the M.C.72 at 709.209 km/hr. This aircraft was fitted with a 24-cylinder Fiat A.S.6 engine developing 3,100 h.p. and driving co-axial contra-rotating airscrews.

That record stood for five years. About a year before the Second World War began in 1939, plans were being made in Great Britain, France, Germany and America to beat the record. The landplane speed record had been gradually increased, but the M.C.72 still held the absolute record.

All of the potential record-breakers conceived at that time were landplanes. In this country Lord Nuffield sponsored the production of a small monoplane specially designed by the Heston Aircraft Co. Ltd. to attack the record. This aeroplane, known as the Heston Special, was powered by a 2,300 h.p. Napier Sabre 24-cylinder engine. Unfortunately it was not ready until the war had started, and, as a result of cooling trouble, crashed on its first flight on June 12th, 1940.

(Above, left) The beautiful Supermarine S.6 (Rolls-Royce R), in which S/L. Orlebar achieved 355.8 m.p.h. in 1929.

(Right) S/L. Orlebar. A few days later he raised his own 355.8 m.p.h. record (unconfirmed) to 357.7 m.p.h.

"Flight" photographs

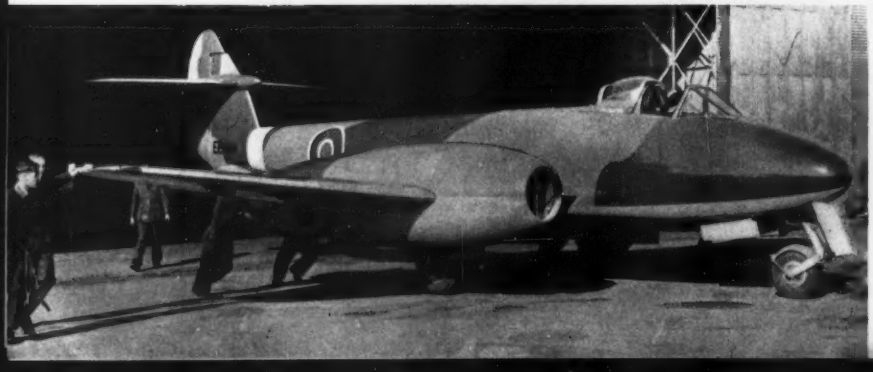
In France two well-known pilots, R. Delmotte and M. Doret, were preparing to make attempts, in a Caudron and a Dewoitine D.500 respectively, while Colonel Roscoe Turner in America was planning to reach 500 m.p.h.

Actually it was Germany that succeeded in taking the record from Italy. The landplane speed record had been pushed up to 610.95 km/hr by Germany in 1937, and Major-General Ernst Udet had flown a Heinkel He 112U over the 100 km closed circuit course at 634.32 km/hr in 1938. On March 30th, 1939, Flugkapitan Hans Dieterle flew an He 112U, fitted with a Daimler-Benz engine specially boosted to give about 2,000 h.p., at Oranienburg, and established a new absolute record at 746.66 km/hr. So for the first time for five years a landplane had flown faster than the fastest seaplane. The high stalling speeds of ten years before were in 1939 accepted as normal, and designers no longer considered it necessary for a 450 m.p.h. aircraft to alight on water.

As a matter of fact, Dieterle's record was not officially confirmed, because a few weeks later, on April 26th, 1939, the record was again raised by Germany, this time by Flugkapitän Fritz Wendel in a specially-prepared Messerschmitt Bf 109R at 755.138 km/hr. This performance became the official absolute world speed record. Not since the 1914-18 war had there been so long a period between two consecutive records. Even so, the increase amounted only to 45 km/hr (27.69 m.p.h.), which indicates that the piston-engined aeroplane was reaching its speed limit. Today the D.H. Hornet, among the fastest piston-driven aircraft, achieves 470 m.p.h., but has the advantage of being a useful standard machine and not one specially hotted-up for the job.

No more records were officially established until after the 1939-45 war had ended, although obviously it was only a matter of convenience before Britain or America should make an attempt. Since 1943 aircraft had been flying at speeds substantially greater than the official world speed record.

The first attempt after the war was made by Great Britain and



"Flight" photograph

In the jet age: The Gloster Meteor 4 with which G/C. H. J. Wilson raised the record to 606 m.p.h. in November, 1945.

on November 7th, 1945, G/C. H. J. Wilson flew a Gloster Meteor 4 at 975.675 km/hr (606 m.p.h.). This was the first record established by a jet-propelled aircraft in any category. The figure showed an increase of 220.537 km/ht (137 m.p.h.) over Wendel's record. Naturally enough, jet types have held the absolute record ever since, although in 1949 the F.A.I. decided to recognise records in both piston-powered and jet-propelled categories, so that Wendel's record, dropped from the official list in 1945, has since been restored as a record in Group 1.

After G/C. E. M. Donaldson had increased the record for this country (to 991 km/hr) in 1946, America made four more attempts and improved the speed each time.

While it has always been necessary to await suitable weather before making a record attempt, the introduction of jet aircraft flying at high Mach numbers has necessitated a further consideration—that of temperature. The speed of sound increases with an increase in temperature, delaying the onset of sonic waves and permitting a greater speed by the aircraft. In this country weather conditions are never good enough to permit high-speed aircraft to fly at their absolute maximum speed. At Muroc, California, the U.S.A.F. has an ideal base at which to break records, and that is partly the reason why that country has managed to increase so substantially the absolute speed record four times between 1946 and 1948. If the Meteors of the High Speed Flight flew at Muroc it is estimated that about another 20 m.p.h. would be added to their speed. The air at Muroc is relatively free from the turbulence which is always met with in Great Britain and which can make flights at high Mach numbers difficult and dangerous.

The first of the American records was made on June 19th, 1947, when Captain Albert Boyd, U.S.A.F., flew a Shooting Star at 1003.700 km/hr, becoming the first man to exceed 1000 km/hr.

The U.S. Navy made the next two records, both with the Douglas Skystreak. Finally the Army, represented by Major R. L. Johnson, had another go and this time pushed up the record to its present figure of 1079.841 km/hr (670.981 m.p.h.). The aircraft used was an F-86, the first swept-wing type to hold the record.

TABLE II: 1920-33 (1km COURSE)

Date	Pilot and Country	Aircraft	Engine	Speed (km/hr)
7.2.20	S. Lecointe (Fr.)	Nieuport 29	Hispano Suiza	275.264
28.2.20	J. Casale (Fr.)	Spad-Herbemont	" "	283.464
9.10.20	de Romanet (Fr.)	Spad-Herbemont	" "	292.682
10.10.20	S. Lecointe (Fr.)	Nieuport 29	" "	296.694
20.10.20	S. Lecointe (Fr.)	Nieuport 29	" "	302.529
4.11.20	de Romanet (Fr.)	Spad S.20	" "	309.012
12.12.20	S. Lecointe (Fr.)	Nieuport 29	" "	313.043
26.9.21	S. Lecointe (Fr.)	Nieuport-Delage Sesquiplan	" "	330.275
21.9.22	S. Lecointe (Fr.)	Nieuport-Delage Sesquiplan	" "	341.023
13.10.22	W. Mitchell (U.S.A.)	Curtiss R.	Curtiss D.12	358.836
18.10.22	W. Mitchell (U.S.A.)	Curtiss R.	"	361.280
15.2.23	S. Lecointe (Fr.)	Nieuport-Delage Sesquiplan	Hispano Suiza	375.000

For an attempt over the 3 km course the following rules as specified by the F.A.I. and detailed in *The Competition Rules of the Royal Aero Club of the United Kingdom* must be followed:—

The distance of the course must be measured by direct measurement or observation by an approved method and by an official survey authority. The course must be approved by the F.A.I. and a permanent course licence issued in respect of it.

The course has to be prolonged at each end by an approach of at least 1,000 m, the extreme boundaries of which must be marked by pylons. The course itself and the approaches thereto must be marked clearly enough for the pilot and the stewards appointed by the Royal Aero Club to see them easily. One steward is stationed at the entrance to the course, one at the starting point and one at the finishing point. The method of marking the course is left to the R.Ae.C., but the F.A.I. must give its approval. For the R.A.F. High Speed Flight attempts at Herne Bay and Littlehampton in 1945 and 1946 barrage ballons and buoys were used. The course can, if necessary, be marked out over land or water.

The aircraft making the attempt must not fly over 1,000 m before entering the course, and over the course itself must not fly higher than 100 m, so that untrue speeds cannot be built up by diving on to the course. To ensure that these conditions are adhered to, observers are carried in other aircraft flying at 500 m, and their certificate that the record-attempting machine has not flown above the observer aircraft is required. The record aircraft carries a barograph, the chart of which is included in the dossier of particulars subsequently sent to the F.A.I. for official confirmation of the record.

The aircraft attempting the record flies over the course twice in each direction and the average speed of the four flights, calculated to the nearest km/hr below the recorded speed, is accepted as the record figure. If more than four flights are made, any four alternate consecutive flights, provided they are made within 30 minutes, may be selected.

TABLE I: SPEEDS FROM 1906 TO 1913

Date	Pilot and Country	Aircraft	Engine	Speed (km/hr)
12.11.06	A. Santos-Dumont (Fr.)	Santos-Dumont	Antoinette	41.292
26.10.07	H. Farman (Fr.)	Voisin	"	52.700
20.5.09	P. Tissandier (Fr.)	Wright Flyer	Wright	54.810
23.8.09	G. Curtiss (Fr., later U.S.A.)	Curtiss	Curtiss	69.821
24.8.09	L. Blériot (Fr.)	Blériot XI	Anzani	74.318
28.8.09	L. Blériot (Fr.)	Blériot XI	"	76.995
23.4.10	H. Latham (Fr.)	Antoinette	Antoinette	77.579
10.7.10	L. Morane (Fr.)	Blériot	Gnôme	106.508
29.10.10	H. Leblanc (U.S.A., later Fr.)	Blériot	"	109.756
12.4.11	H. Leblanc (Fr.)	Blériot	"	111.801
11.5.11	E. Nieuport (Fr.)	Nieuport	"	119.760
12.6.11	H. Leblanc (Fr.)	Blériot	"	125.000
16.6.11	E. Nieuport (Fr.)	Nieuport	"	130.057
21.6.11	E. Nieuport (Fr.)	Nieuport	"	133.136
13.1.12	J. Vedrines (Fr.)	Déperdussin	"	145.161
22.2.12	J. Vedrines (Fr.)	Déperdussin	"	161.290
29.2.12	J. Vedrines (Fr.)	Déperdussin	"	162.454
1.3.12	J. Vedrines (Fr.)	Déperdussin	"	166.821
2.3.12	J. Vedrines (Fr.)	Déperdussin	"	167.910
13.7.12	J. Vedrines (Fr.)	Déperdussin	"	170.777
9.9.12	J. Vedrines (U.S.A., later Fr.)	Déperdussin	"	174.100
17.6.13	M. Prévost (Fr.)	Déperdussin	"	179.820
27.9.13	M. Prévost (Fr.)	Déperdussin	"	191.097
29.9.13	M. Prévost (Fr.)	Déperdussin	"	203.850

In measuring the speed an accuracy of plus or minus 0.5 per cent (recently increased from 0.2 per cent) is required. The old figure of 8 km/hr required before a new record could be confirmed has been abolished, and it is now necessary for the existing record to be beaten by one per cent. That means that any aircraft attempting to improve upon Major Johnson's record in the F-86 Sabre will have to fly at about 1091 km/hr (678 m.p.h.). After the demonstrations of the Hawker P.1081 and the Supermarine 535 flying at Farnborough last year there seems to be no reason why, with developments of these aircraft, Great Britain cannot regain the record. It is six years since we held it.

Not one of the "absolute" records—speed, height and distance—stands to the credit of Great Britain; all are held by America. (It should, of course, be remembered that the absolute height record is held by a balloon; Britain does possess the "heavier-than-air" record, secured by G/C. Cunningham, Vampire, at 59,446ft.)

Since the Annual Conference (the 43rd) of the F.A.I., held in Stockholm last year, it is possible for the absolute speed record to be made at an unlimited height. With aircraft flying at supersonic speeds the maximum speed cannot be achieved at low level. Obviously the 3 km course would be too short over which to measure such attempts, so the length of the course in this case is extended to 15-25 km with an entrance, or "run-in," of 5 km. Two flights, one in each direction, must be made and measurement must be to within an accuracy of 0.5 per cent.

One of the most important of the conditions for the speed record at unlimited height is that any means of launching an aircraft making such an attempt is authorized. This means that a small aircraft with rocket- or jet-propulsion, provided it carries a pilot, can be carried up to height under a larger aircraft.

Other conditions are as for a speed attempt over the 3 km course.

So far no attempt has been made to gain a record under these new conditions, and the whole question of accurately observing and timing such a flight is one raising important issues. The cinécamera methods employed in 1945 and 1946 are obviously outdated and it seems like a job for the National Physical Laboratory to establish a suitable means by radar.

TABLE III: 1923-1948 (3 km COURSE)

Date	Pilot and Country	Aircraft	Engine	Speed (km/hr)
29.3.23	R. L. Maugham (U.S.A.)	Curtiss R-6	Curtiss D.12	380.751
2.11.23	H. J. Brow (U.S.A.)	Curtiss R-6	Curtiss D.12	417.059
4.11.23	A. J. Williams	Curtiss R-6	Curtiss D.12	429.025
11.12.24	A. Bonnet (Fr.)	Bernard-Ferbois	Hispano Suiza	448.171
4.11.27	M. di Bernardi (It.)	Macchi M.52	Fiat AS 3	479.290
30.3.28	M. di Bernardi (It.)	Macchi M 52bis	" "	512.776
12.9.29	A. H. Orlebar (G.B.)	Supermarine S.6	Rolls-Royce	575.700
29.9.31	G. H. Stainforth (G.B.)	Supermarine S.6b	Rolls-Royce	655.000
10.4.33	F. Agello (It.)	Macchi-Castoldi M.C.72	Fiat	682.078
23.10.34	F. Agello (It.)	Macchi-Castoldi M.C.72	Fiat	709.209
26.4.39	F. Wendel (Ger.)	Messerschmitt Bf 109R	Daimler-Benz	755.138
7.11.45	H. J. Wilson (G.B.)	Gloster Meteor 4	2 R-R. Derwent	975.675
7.9.46	E. M. Donaldson (G.B.)	Gloster Meteor 4	2 R-R. Derwent 5	991.000
19.6.47	A. Boyd (U.S.A.)	Lockheed P-80	G.E.C. J-33	1003.700
20.8.47	T. Caldwell (U.S.A.)	Douglas D-558	G.E.C. J-35	1031.178
25.8.47	M. E. Carl (U.S.A.)	Douglas D-558	G.E.C. J-35	1047.536
15.9.48	R. L. Johnson (U.S.A.)	North American F-86	G.E.C. J-47	1079.841

No. 7 SQUADRON

By JOHN YOXALL

PART II

The History of a Famous Bomber Squadron

FEBRUARY 10th, 1941, was an important day, marking as it did the squadron's first operation in World War II. Three Stirlings, captained by S/L. Griffith-Jones, D.F.C., S/L. Lynch-Blosse, D.F.C., and F/L. Howard Smith, successfully bombed oil-storage tanks at Rotterdam; 46 × 500-lb bombs were dropped. All three aircraft returned safely from this trip but later in the same month S/L. Lynch-Blosse failed to reappear after attacking shipping in Brest harbour. It was not until after the crew's relatives had been informed that it was found out that the Stirling had landed at Boscombe Down after jettisoning its bombs "safe" on Salisbury Plain.

Oakington itself was visited by a lone Dornier but the only damage sustained by No. 7 was a slightly chipped elevator.

The first casualties were S/L. Griffith-Jones and his crew, who did not return from a raid on Brest on March 3rd; some of them were known later to be prisoners of war. Brest at this time was the squadron's chief target, mainly because of the presence there of the two battle cruisers *Scharnhorst* and *Gneisenau* (nicknamed "Salmon and Gluckstein").

The German capital was first attacked by No. 7 on April 17th, when F/L. Williams dropped a 5 × 1,000-lb and 7 × 500-lb load on targets in Berlin. Occasionally, also, there was a daylight raid on German or Dutch docks or on enemy convoys moving along the continental coast. The night trip to Berlin from Oakington and back took at least five hours, and a raid on Brest harbour about the same; the elapsed time was to a great extent dependent on the routeing of the raid. Four aircraft were the squadron's usual contribution to a raid in April, but a month or so later this was stepped up to six and occasionally nine Stirlings.

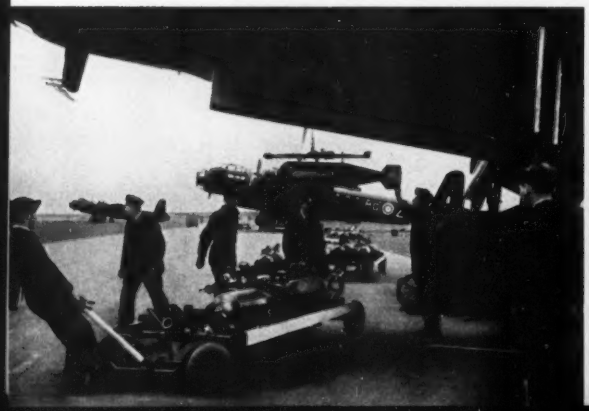
Excitement ran high during the chase and sinking of the *Bismarck* in May, 1941. Seven aircraft of No. 7 put in 52 flying hours searching for the cruiser *Prinz Eugen*, which had parted company with the crippled battleship. The search was led by W/C. Graham, but unfortunately the ship was not located. As soon as it was known that the cruiser had reached Brest the squadron made more heavy night attacks, at times sending in seven Stirlings. It proved to be a difficult and unsatisfactory target, owing to the smoke screens continually laid by the Germans.

On the daylight raids there were frequent excitements. For instance, on June 10th, two Stirlings—S/L. Seale and F/O. Blacklock, D.F.M.—left in the afternoon with Emden as their objective. Cloud cover failed and the Stirlings turned back. Blacklock was attacked by three Me 109s; he immediately went down to sea level while heading towards cloud cover. The Germans opened fire at 300 yards with both cannon and machine guns, breaking off at 150 yards. Sgt. Graham, the rear gunner, engaged the enemy first on the port and then on the starboard side. Two further double attacks were made and on one run the German aircraft approached from dead astern. The Stirling jinked to starboard and a Messerschmitt went to port, giving Graham an opportunity to get in a long burst; he hit the fighter in the centre of the fuselage, whereupon it dived straight into the sea.

By now two of the rear guns had gone u/s, but in spite of seven or eight repeated attacks Graham cleared the stoppages, meanwhile instructing his captain on which way to turn to avoid being hit. A final attack came from the starboard bow, when Sgt. Ashton, the front gunner, managed to get in a long burst before the Messerschmitt broke away. The engagement had lasted 18 minutes. Both Stirlings returned to base but Blacklock's was considerably damaged. Three weeks later Blacklock was in trouble again in the same area. The Stirling accompanying him (F/L. Collins) was shot down by some yellow-nosed Messerschmitts and, to add to his troubles, his own aircraft was "jumped" by some Hurricanes as it crossed the coast near Southwold on the homeward journey.

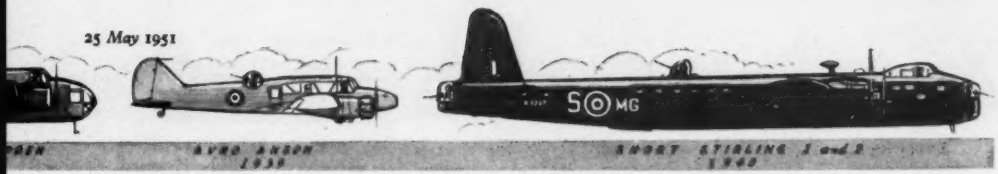
It was a difficult and testing period. Almost every aircraft, whether operating by day or by night, was attacked by enemy

Dolly-loads of bombs being hoisted into the bomb-bays. The Stirling's maximum bomb load was 18,000 lb.



Stirling bomb aimer: he is holding the release; on the right are the selection switches.

A rear gunner testing the articulati turret and the four 0.303



fighters while over or near its target. Yet the aircrews' spirit remained remarkably high. A particularly unfortunate loss was that of F/O. Kinnane and his crew, who were shot down while orbiting a crew in their dinghy after a raid on Borkum.

It must be remembered that all the raids up to this time had been made without fighter escort. The first mention in the squadron diary of accompanying fighters is in the account of a daylight raid on the submarine and repair base at Le Trait by three aircraft at the end of June, 1941.

Occasionally the English weather caused more casualties than either enemy flak or fighters. On July 14th, six Stirlings were detailed for a raid on Hanover. Between them they dropped 30 × 1,000-lb, 33 × 500-lb bombs and 10,500 incendiaries in a very successful attack. The return was not so fortunate. F/O. Witt, alarmed at the rate of his fuel consumption, ordered his crew to prepare for a ditching. They managed to reach the coast before baling out, the aircraft crashing at Newton-Flotman, Norfolk. Weather deteriorated very rapidly and F/O. Rolfe was the only one to land at base. F/S. Madgwick flew on until his fuel was exhausted and then baled out; the crew landed safely, but Madgwick himself was killed. F/L. Sanders came down at Bircham Newton, where he overshot the airfield and hit a dyke, breaking the port undercarriage leg and a wing. S/L. Speare landed safely at Waterbeach and P/O. Blunden finished up at Honington, at 0450 hr, with damaged wheel-doors. By this time cloud base at Oakington was 50ft.

A more fortunate raid was one made by three more Stirlings on the battle cruiser *Scharnhorst* while it was at La Pallice in July, 1941. Each of the machines carried three 2,000-lb armour-piercing bombs. From 13,000ft F/O. Walker obtained a direct hit with the only one of his bombs which dropped—the other two hung up. Six Messerschmitts attacked the formation of bombers as they left the target but did not get things their own way. Sgt. Capel shot two of them down into the sea and damaged another. This effort earned a well merited "Well done, 7 Squadron" from Air Marshal Sir Richard Peirse, who was then A.O.C.-in-C. Bomber Command. F/O Walker gained an immediate D.F.C. and Sgt. Capel the D.F.M.

At the end of the month the weather again made its unpleasant self felt in a particularly spectacular manner. W/C. Graham, the commanding officer, piloting one of five aircraft raiding Cologne, flew into an electrical storm 30 miles S.E. of Bexhill. At 10,000ft, with a temperature of —4 deg, severe glazed ice began to form. After a few minutes there was a blinding flash and the Stirling fell 6,000ft before Graham managed to regain control. Surveying his panel, the wing commander found that all the flying instruments were u/s, and that both the P.4 and D.R. compasses now had their N position in the direction of the starboard wing-tip. Eventually, by means of dead reckoning, QDMs and map reading the Stirling arrived safely back at Oakington, the compasses remaining 70 deg in error.

Toward the end of the year bad weather was responsible for a number of the operations being cancelled and made many of the targets difficult to recognize. Yet it was in October that the squadron reached double figures for the first time by contributing ten aircraft to a "Salmon and Gluckstein" raid.

Casualties were high. On November 7th two Stirlings failed to return; another was lost on the 15th; and yet another was missing three days later. December opened with more bad weather; for one period of four days visibility was down to 50 yards. Brest was still the main target and on the 18th W/C. Graham, D.S.O., led the squadron—which in turn led Stirlings, Halifaxes and Manchesters—in a daylight raid against the two cruisers in dry dock. W/C. Graham's aircraft was hit both by flak and by fighters, but P/O. Mitchell, his rear gunner, shot down one Messerschmitt, which was seen to crash in a field. S/L. Jennings failed to return but some of his crew were seen to leave by parachute. Sgt. J. M. Smith (P/O. Bayley's rear gunner) got an Me 109, the pilot of which baled out. P/O. Heard, while releasing his bombs in a shallow dive, had the astrodome of his aircraft blown off by flak, which also badly wounded the flight engineer, Sgt. Hayward, who died three days later. Sgt. Inman was also hit but, to quote the words of the squadron diary, "did not tell anyone about it until some while afterwards." W/O. Taylor's Stirling was badly shot up. The port inner tanks were pierced, turrets u/s, intercom gone and one front tyre and both tailwheel tyres burst. He landed safely at Bourn. F/L. Parnell failed to return. P/O. Matkin's aircraft also suffered heavy damage. Hydraulics and undercarriage were u/s and a large portion of the rudder was shot away. He crash-landed at Oakington, and made a very good job of it, for none of the crew was hurt.

A number of congratulatory messages were received, including one from Flag Officer Submarines, which read: "I do congratulate you. I do not think I will bother to send my submarines to sea next time." So ended 1941.

Early in the year came news of various awards earned by both ground and aircrews. The squadron was taken off operations

F/L. Crebbin, D.F.C., who commanded No. 7 Conversion Flight in 1942.

his power-operated
vning guns.

King Peter of Yugoslavia being shown the cockpit of the Stirling by the commanding officer, W/C. R. H. Graham, during a visit in 1941.

W/O N. L. Tayler, D.F.C. in the pilot's seat of his Stirling.

AVRO LANCASTER 1 and 3
1945

AVRO LINCOLN 2
1950

No. 7 SQUADRON . . .

while new navigational devices (Gee) were fitted. On January 8th came the news that S/L. Jennings and Sgts. Webb, Davis, Lister and E. V. Smith were safe as prisoners of war. February began with a very cold spell and the aircrews spent much of their time shovelling snow from the runways. The only operation of the whole month was flown on the 12th when two Stirlings (P/O. Matkin and W/O. Nicholls) took off to search for the escaped *Scharnhorst* and *Gneisenau*, which were sneaking up the Channel under cover of low cloud. Nicholls alone got a fleeting glance of one of the ships through a break in the clouds at 800ft and then lost it again. Bombs were brought back.

March opened with an attack on the Renault factory at Billancourt, which was producing armament for the Germans. This raid, together with one on Essen and a third on Lubeck—where three aircraft were lost—constituted the only operations for the month.

The squadron was visited and went visiting. Lord Trenchard, the premier Marshal of the Royal Air Force, went up to Oakington, and a selected number of squadron members came down to London to be entertained at lunch by Short Brothers, the builders of the Stirling. In after-lunch speeches the activities of No. 7 were recounted. Since February, 1941, 1,600 tons of bombs had been dropped on enemy territory in 525 sorties, at a cost of 29 aircraft and 199 casualities in killed, missing and prisoners of war. One D.S.O., 12 D.F.C.s and 12 D.F.M.s had been gained and the squadron claimed 34 enemy aircraft destroyed.

No. 7 then went "Gardening." "Veg" were taken and planted and, if the exact spot in the "garden" could not be located, then the "veg" was brought back. In other words, the Stirlings went minelaying—"Gardening" was the overall code word and vegetables were the parachute mines, which had to be positioned very exactly.

April, 1942, was a month of records. Sorties topped the hundred mark for the first time—the actual number was 105; only one aircraft was lost and 262 tons of bombs were dropped. W/C. Sellick, who had taken over from W/C. Graham, thanked the ground staff for their efforts to keep the Stirlings flying.

For the 1,000-bomber raid on Cologne (May 30th), one of the largest air operations of the whole war, No. 7 co-operated with the other units at Oakington to contribute 19 aircraft. Four of these got into trouble of one sort and another but all returned safely to base. Shortly after this raid the King and Queen paid a second war-time visit and were shown the over-target photographs taken at Cologne.

The unit was now working very hard and hitting the enemy severely. The average effort was nine or more sorties and during July alone 114 sorties were flown. By reason of the quality of its work the squadron was then appointed to the role of pathfinders and the first effort at this new task came on August 28th, 1942, when 11 sorties were flown. Of these, two were abandoned owing to engine failure, two did not return (W/C. Shewell and F/S. Shumsky) and Sgt. Land's Stirling was badly shot up.

A fortnight later an amazing example of bravery and discipline was shown by two aircrews. Nine aircraft were detailed for a raid on Dusseldorf and, after the marker flares had been dropped across the aiming point, large fires were caused by the subsequent bombing. P/O. Watt had to abandon the target, as his navigator, P/O. King, was wounded in the stomach and knee. King, however, continued to navigate all the way back to base. F/O. Trench bombed the target but his Stirling was repeatedly hit by flak. A starboard petrol tank was holed and port oil-pipes severed. The port inner airscrew and reduction gear sheared and the port outer engine fell right out. Sgt. Edwards (W/Op.) assisted his captain by pressure on the rudder bar and stick to keep on an even keel. Height was lost and the Dutch coast was crossed at about 150ft; all moveable objects had to be jettisoned to maintain even this height.

Eventually the English coast was reached and, coincident with its crossing, the starboard inner engine faded out. A crash-landing was made near Weeley, Essex. F/O. Trench and Sgt. Edwards were knocked unconscious but were extricated by the navigator, P/O. Selman. The crashed Stirling then burst into flames while the rear gunner, P/O. Glendenning, was still in his turret. The front gunner, Sgt. Thorpe, and the flight engineer, Sgt. Mallott, re-entered the blazing aircraft to rescue him, but the fuel tanks blew up at that moment and both were killed. P/O. Glendenning, badly burned, was finally rescued by F/L. Jenner the mid-upper gunner. F/O. Trench was awarded an immediate D.S.O., P/O Selman the D.F.C. and Sgt. Edwards the D.F.M.

Germany was not, at this time, the only target, though it received the major effort. By the end of October, 1942, No. 7's aircraft were going as far afield as Genoa, Turin, Savona and Milan. Most of the raids on Italy were very successful, the weather conditions over the target were usually good and the resistance light. During one of the raids on Genoa F/L. Heywood saw a "yellowish" explosion which was so enormous that flaming debris came right up through the cloud layer.

An innovation for 1942 was the establishment of No. 7 Conversion Flight, affiliated to the squadron. The purpose of this unit was to give new arrivals aircrew training on Stirlings for two weeks. The syllabus included cross-countries, day and night bombing, air firing, climbs with full war load and leaflet raids over enemy-occupied territory. The complete curriculum required some 35 flying hours. F/O. Ellis-Brown formed the new Flight, which was then taken over by F/L. Crebbin, D.F.C., one of the most experienced of No. 7's captains. This unit was short-lived, for ten months later it moved to Stradishall to become part of No. 1657 Conversion Unit under W/C. Ker.

Bad weather again curtailed operations in the early months of 1943; only nine sorties were flown in January. Despite ever-increasing navigational aids there was still considerable difficulty in identifying targets in bad winter weather.

On March 1st, two of No. 7's aircraft attacked Berlin; the P.F.F. work was well concentrated and the glow from the resulting fires could be seen over 100 miles away. Four days later there was an equally effective attack on Essen but during the following week five crews were lost in as many days. These losses included F/L. Trench and his crew. One of these Stirlings, piloted by Sgt. Toupin, failed when nearing the English coast after raiding Nuremburg. The crew took to their parachutes; but with the exception of Sgt. Spanton, who landed in a field, and Sgt. Kilvington, whose body was recovered from the sea, none was found. The abandoned aircraft came down on a sandbank in the Channel.

The Stirlings had given the squadron excellent service but the time came when they had to be superseded: on May 11th, the first Avro Lancaster 3 arrived. Concentration at the period was on the Ruhr towns and the weight of the attack was ever increasing. No. 7 occasionally sent as many as 20 aircraft. Curiously enough, even in June of that year, bad weather prevented any operations being flown for the first 12 days. On the 19th, 22 machines attacked Le Creusot and all returned safely, but three days later no fewer than four crews, including three of the squadron's most experienced teams, were lost in a raid on Krefeld. A further three were lost on the 25th and one of these was W/C. Barrell, O.C. "B" Flight, who was on his 60th operation with the squadron. It was his last sortie before becoming tour-expired for the second time.

In addition to operational flying, training flights with the new Lancasters had to be made. The first operation with the Lancasters was on the moonlit and cloudless night of July 12th when four of them visited Turin. On July 22nd the establishment was changed from 16 Stirling and eight Lancasters to 24 Lancasters, all fitted with H2S apparatus. The last Stirling left the squadron on September 1st.

During August the total monthly sorties went over the 200 mark

(Left) S/L. Griffiths-Jones, D.F.C., whose crew were the first No. 7 Squadron casualties in the 1939-45 war.

(Right) W/C. T. G. Mahaddie, D.S.O., D.F.C., A.F.C. He and all his crew were decorated for bringing a badly damaged aircraft back from Cologne.

The most difficult Air Route in the World

ACROSS THE ATLANTIC 1919

The Rolls-Royce "Eagle" powered Vickers Vimy made the first direct crossing of the Atlantic by air, in 16 hours 12 minutes.

ACROSS THE ATLANTIC 1951

The Rolls-Royce "Avon" powered English Electric Canberra was the first jet aircraft to fly the Atlantic direct without refuelling, in 4 hours 37 minutes.

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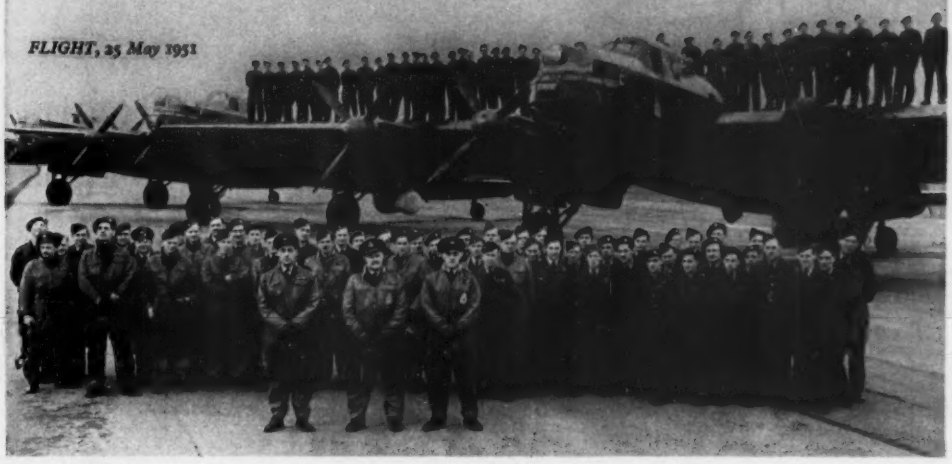

Avro Lincolns form the stage and backcloth for a squadron group in 1951.

No. 7. SQUADRON . . .

and flying hours totalled 1,660. In a vital raid on the German experimental base at Peenemunde, 17 aircraft took part and each carried for the first time a 4,000-lb "cookie."

The squadron's annals here record the award of the King's Standard for 25 years of service. The short period of disbandment after the 1914-18 war was the reason for the honour not having been awarded in 1939.

Of No. 7's day-to-day work during this period reports read almost monotonously: "Cologne and Dusseldorf were attacked"—"A large force went to Mannheim . . . seems to have been a good raid"—"21 sorties to Berlin . . . one aircraft missing," and so on. The last operation of the year was by 18 Lancasters on Berlin. Two of them collided over the target but all returned safely. The collision was undoubtedly the outcome of the dense concentration of aircraft over the target area now that raids were so heavy.

For the same reason, our aircraft were occasionally hit by bombs from other machines flying above them. On the night of January 14th, 1944, S/L. Campling, flying D Dog, was hit while over the target at Brunswick by four incendiary and one H.E. bomb. These caused loss of petrol and fires broke out. The crew were ordered to stand-by to abandon aircraft but fortunately the fires died out and a successful landing was made at Coltishall. Ten days later a similar accident happened to F/O. Williams during a raid on the big ball-bearing works at Schweinfurt. He, also, got back to England and put his damaged Lancaster down on the special emergency runway at Woodbridge.

By the middle of March it had become more usual than otherwise for No. 7 to contribute over 20 aircraft as their share in a raid, and this in spite of the fact that the unit was reduced to a two-flight basis, owing to the third flight having gone to Little Staughton to become the nucleus of No. 582 Squadron.

With the approach of D Day, operations were switched from Germany to France, the coastal areas and railway marshalling yards having particular attention paid to them. On the great day itself some of the five Lancasters which had set out before midnight to bomb Merville/Franceville, and were on their way home, saw the first evidence of the attack on Hitler's fortress.

Strategic targets to prevent the Germans from bringing up reinforcements became of major importance but "constructional works"—in other words V.1 and V.2 launching sites—were by no means neglected. Many of these targets were attacked in daylight. They were small and difficult to hit and the weather was such that frequently aiming had to be done by Gee and H2S. Occasionally the targets were purely tactical, as on July 7th, when an evening attack was made on Caen, just in front of the Allied lines. Bombs were dropped from 8,000ft.

The whole of July was busy but not a single aircraft was lost from the 236 operational sorties flown. Several were damaged and had to land away from base, while F/O. Perry's Lancaster was so badly hit that he told his crew to bale out. Owing to fires, however, only the rear gunner, F/S. Shane, was able to get away.

AWARDS, 1941-45

G.M.	1	M.B.E.	1
D.S.O.	35	C.G.M.	1
Bar to D.S.O.	1	D.F.M.	139
D.F.C.	327	Bar to D.F.M.	1
Bar to D.F.C.	38	Silver Star (U.S.A.)	1

The fires died out and the damaged bomber was nursed back to be crash-landed at Bungay, Essex. All the crew were suffering from burns but F/S. Shane was the only one missing.

Some of the daylight bombing was extremely accurate. For the third daylight attack to be undertaken on August 4th, 1944 Master and Deputy Master Bombers and two Supporters took off for the long trip to Pauillac to attack the oil refinery there. Exceptional results were obtained. The Master Bomber's target indicator was seen to fall slap on the aiming point, and the target was quickly covered by dense smoke rising to 10,000ft with flames as high as 2,000ft. The main force had to be instructed to bomb from at least 9,000ft to avoid passing through the smoke. In the whole of this attack only three sticks of bombs dropped outside the target area, and of these one straddled a jetty, setting two tankers on fire. All the aircraft returned safely.

By the second week in August the invasion battle had reached such a pitch that No. 7 was asked repeatedly for extra efforts—either to bomb in the actual battlefields or to attack special targets. On the 12th, for instance, 21 sorties were flown against four targets. This entailed more than one operation in a day for some of the aircrews and aircraft, but it was at the time of the Falaise encirclement and much havoc was wrought on the enemy.

A daylight operation typical of the time was one flown on August 14th, when eight aircraft were detailed for an attack on an aiming point in the battle area. Weather was clear and the attack was pressed home in seven minutes. Owing to a smoke screen drifting across the target, the first T.I.s were not seen until they were on the ground. It was then evident that those of both the Master Bomber and of his deputy (both from No. 7) were touching the aiming point to the south-west. The main force was instructed to bomb these. Some bombing was at first seen to undershoot by some 1,000 yards so the Master Bomber ordered the main force to switch to southerly yellows with one, and later two, seconds overshoot. The next instructions were to ignore greens which had fallen 800 yards to the north-east but to bomb reds and yellows at the base of a smoke column. Bombing was very concentrated round the aiming point but crept a little to the south and east.

The raid had proved exceedingly difficult for the Master Bomber to control because of the smoke continually drifting across the area. There was heavy flak. Unfortunately one aircraft undershot its bombs considerably owing to an electrical fault which caused the bombs to be released immediately on opening the bomb doors.

When the Falaise battle died down the squadron returned to its more familiar task of bombing Germany by night. Stettin, Kiel and Bremen were among the targets visited. The port of Brest in France was also attacked and from this stoutly defended area two aircraft failed to return.

The last raid of the month was on Stettin and for this No. 7 alone provided: Primary Visual Marker, three Blind Markers, two Visual Centrers, three Blind Illuminators, a Blind Secondary Marker and three Supporters.

September was again a month of round-the-clock bombing. Le Havre was a main target but airfields in Belgium and Holland were also visited. Afternoon attacks were made on German targets (Kamen and Münster) and these were interspersed by full-scale night attacks and returns to the battle areas where our land forces were going ahead so fast.

Over-target conditions at the end of 1944 reflected the air superiority then held by the Allies. No. 7 bombed by day and night—even such hot targets as Dortmund were visited in day-

No. 7 SQUADRON . . .

light for no casualties. For one period, in which 750 operational hours were flown in 146 sorties to drop well over 700 tons of bombs, the only casualty was one bomb-aimer wounded.

The final year of the war opened with No. 7 still at Oakington. It was by now a most experienced pathfinder unit. Synthetic oil plants were the main targets but, as is usual in the early months of the year, weather had a good deal to say in the matter.

No casualties gradually became more the rule than the exception. The squadron diary frequently refers to "defences slight" or even "defences nil." Germany was on the way out.

And so, on April 25th, the squadron came to make its final raid with bombs. The target was an aiming point on the island of Wangerooge; ten Lancasters took part and found practically no opposition.

In May supply-dropping to the Dutch took the place of bombing. The technique remained the same and the squadron chronicles still used the same terms. For a force of seven aircraft detailed to drop supplies to the starving Dutch in Rotterdam there were three Master Bombers, two Deputy Master Bombers and two Supporters. "The white cross was seen by six of the seven crews. Target indicators fell beyond the cross—the nearest being 300 yards and the furthest 600 yards distant. Supplies were dropping in the correct place."

When peace came on the 8th there was a short spell for celebration and then "Cook's Tours" were laid on for the staff and ground crews to go and see for themselves the effect of the bombing in Germany. In addition, a large number of flights were made to bring prisoners of war back home.

When this work finished an intensive training programme was entered into in preparation for a move to the Far East to carry on the war with Japan. This was interrupted somewhat by eight crews being posted to Transport Command and the exchanging of some of the Lancaster 3s. for Mark 1s. There was also a move to Mepal.

The present commanding officer, S/L. S. C. Ladyman, with his flight commanders. Left, F/L. R. A. Kirkland. Right, F/L. R. A. Cunningham.

Peace came in the East before the squadron could get there and gradually came the inevitable whittling down. Instead of 12 or 14 Lancasters being sent on "Dodges," "Spasms" and other exercises the numbers dropped to two or four. Dropping 11¼-lb practice bombs was also a trifle tame after the previous hectic years.

A little excitement came in November, 1946, when F/L. Head and his crew were detailed to seek for a Dakota in the Alps. His was the first of any of the searching aircraft to find the missing machine and he dropped Lindholme gear, supplies and blankets to the stranded occupants.

Security draws somewhat of a veil over the squadron's present whereabouts and over details of their occupation. They have made long trips to the Far East and back and flown very successful "Sunrays" to the Middle East. Lincolns have long since replaced the Lancasters and it is interesting to speculate as to what type of aircraft No. 7 will have next. But one thing is certain, whatever its aircraft and whatever its job No. 7 Squadron can be guaranteed to put up a good show.

A NOTABLE WAR DIARY

THOUGH the reviewer's copy of this book* is inscribed "Avec toutes les amitiés d'un vieux camarade . . ." he is completely unbiased in commending it as the finest air-fighting story of the last war. To describe the book one needs only to describe the author, for never did a man live in his writings as does Pierre Clostermann in this vividly exciting account of his career as an R.A.F. fighter pilot.

Pierre was ever an artist at self-expression and his friends will remember how well he often used this artistry, in the early days, to placate an angry flight commander or confound a station warrant officer with garbled yet convincing explanations of why he was late for parade, or why his flight had lasted an hour instead of the allotted thirty minutes.

From this newly published rendering of his war-time experiences it is apparent that he has lost none of his talent. Fortunately for posterity, Pierre had, above all, the personal courage and determination of a true artist—courage not only of the sort which showed itself when he was cornered by an angry swarm of Fw 190s, but of the kind which enabled him to measure his own feelings at the end of a day's fighting, when nerves were still jarring to the spitting of an enemy's guns and a long-awaited dinner lay tasteless on the plate as its would-be consumer wrestled with the memory of having seen his best friend die before his eyes.

With these kinds of fortitude Clostermann was fully endowed, and his book—of no accepted narrative form—is no more than a diary of his battles both with the enemy and with himself. In each of these theatres of operation he proved himself an "ace." Of victories he counted 23; against himself he also remained invincible—epitomizing the fearless fighting spirit of his gallant comrades in the Free French Air Force.

Every evening, for the benefit of his parents, he patiently recorded the story of his life with the R.A.F., and by the end of the war his jottings filled three large notebooks, which accompanied him everywhere. After two years of peace he published them, so that—in his own words—"Free Frenchmen might be reminded of their own hopes and loyalties" in those darker years and so that the tales of their sons' deeds might give some consolation to the families of his fallen friends.

The rigours of translating these pages from the French (Oliver Berthoud performed the task) has not dulled their lustre; some of them bring a chill to the spine, others a lump to the throat, but not one can be passed over lightly.

The breathless concentration as the judder of a Spitfire's cannon answers the anxious thumb at the gun-button, heart-beats quickening at the telephone's urgent tinkle, the proud yet pitiful show of bravado as the lone pilot returns without his comrades—all those undying moments of a fighter pilot's life are here, recorded by a man who lived these sensations more fully than most.

The Big Show is a book to be read from cover to cover, and then from page to page—at random, as the nerves permit. It is one of the finer things that emerge from war. E. A. G. R.

"The Big Show," by Pierre Clostermann, D.F.C. Chatto and Windus, London. Price 12s. 6d. Illustrated.

DE HAVILLAND PROGRESS

THE 1950-51 directors' report and accounts of the de Havilland Aircraft Co., Ltd., are a model of clarity and artistry in presentation. Not only are they illustrated with photographs and drawings (the coloured frontispiece is an air-to-air close-up of the Comet in colour), but a special graph shows how each £100 of the revenue of the parent company for the year to September 30th, 1950, was utilized. Materials and sub-contractors accounted for £61 18s. 0d.; £26 1s. 7d. went on wages, salaries, insurance, pensions, superannuation, holidays with pay, etc.; £7 12s. 0d. on depreciation, light, heat, power and other charges; £2 11s. 7d. on taxation; 19s. 7d. was ploughed back as reserves and capital profits; and net dividends accounted for 17s. 3d.

Introducing the report, the chairman, Mr. F. T. Hearle, said that the swift progress which had been made in development trials of the Comet, and the surprising pace with which the larger British turbines had come along, had enabled the company to start work on an alternative Comet version for the "long and severe stages of world travel." The company was hoping, he said, to fly this Series 2 Comet, having Rolls-Royce Avon turbojets, within a year. The Series 1 Comet, with de Havilland Ghosts, remained the more suitable version for medium stages, and would be in service two or three years earlier. "We may expect competition," said Mr. Hearle, "but our aim is to keep the lead which we have established."

At the fourth annual general meeting of de Havilland Propellers, Ltd., the chairman, Mr. W. E. Nixon, mentioned some typical current aircraft types (altogether there are 47) on which D.H. airscrews are standardized. Of forthcoming installations, hollow steel-bladed airscrews were in production for the Saunders-Roe Princess and the Bristol 175 medium-range airliner.

Mr. Nixon also said that the company's high-precision production facilities had been of value to the parent company; he cited the bogie undercarriage of the Comet as an example.

Do you know your airfields?

10

Recognize this airfield? It's No. 10 in this series of puzzle photographs. You'll find the answer below on the right. ★

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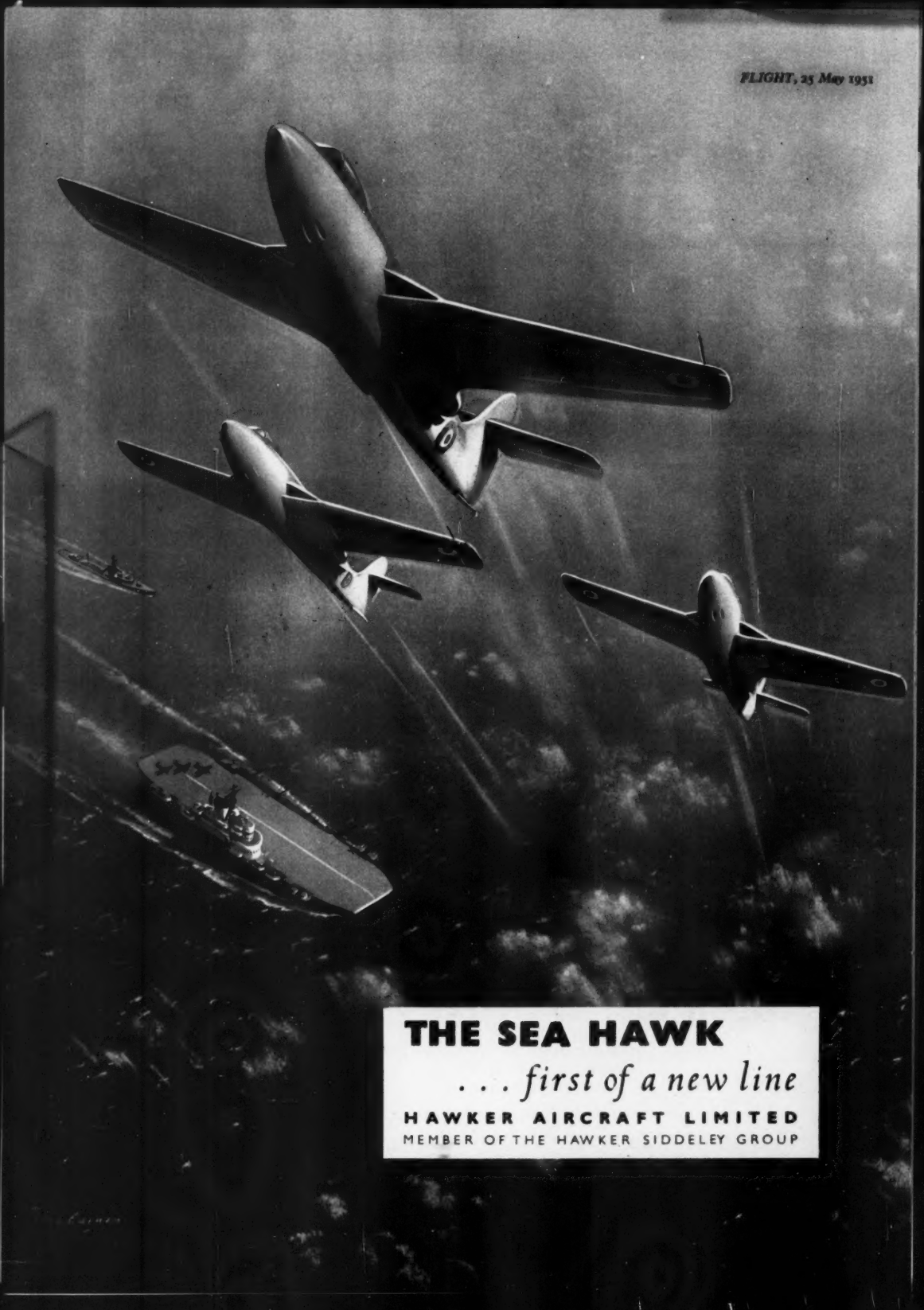

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HUCKNALL ON HOLIDAY

70,000 "Watch the Jets Roar By"

OF Hucknall's Whit-Monday air display it might be said that the advance publicity set the keynote—"A thrill a minute at this giant air spectacle : watch the jets roar by." As we briefly recorded last week, this was an invitation accepted by the citizenry to the tune of 70,000, and the Soldiers', Sailors' and Airmen's Families Association should benefit accordingly. Air Chief Marshal Sir Philip Joubert, appeal director, should by now be feeling well content with the results of his own and his henchmen's labours.

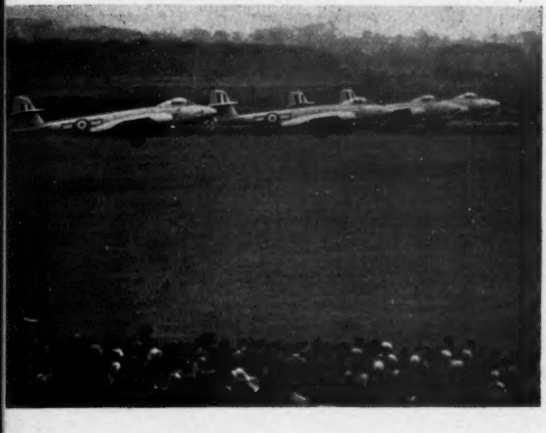
It was unquestionably a bank-holiday *in excelsis*, with the vast crowd doing all the things in which bank-holiday crowds delight. As we have observed on similar occasions in the past, most of the finer points of some very good flying were doubtless lost on the majority; by the middle of the afternoon whole families were queueing for ice cream, with hardly an eye to spare for Commandant Perrier of the Patrouille d'Etampes buzzing along, upside-down, close above their heads. Yet so long as they enjoyed themselves (which they obviously did) and had put down their half-crowns for the good cause (as clearly they had) who are we to cavil?

A cold, unseasonable "clamp" which had been sitting firmly on the area all morning obligingly lifted at 2 p.m. to offer sunshine and six-mile visibility.

Demonstrations of light aircraft have been known to bore even the *cognoscenti* and, wisely, they were confined to two, both by pilots adept at disproving any such generalization : Pat Fillingham, who led off in a Chipmunk, and Ranald Porteous in the "cross-wind" Auster. Then Gerry Smith, of the Rolls-Royce test department, but having no use for a prime mover notwithstanding, was towed to 3,000ft or so in an Eon Olympia and descended aerobatically with that silent, tight-turning agility of which only the sailplane is capable, concluding with a high-speed beat-up in which the wings could be seen flexing in a quite startling series of jolts, for the day was a bumpy one.

Next came sterner stuff, the R-R. flight-test staff, whose home field this is, turning out the younger Heyworth brother with the Nene-cum-Merlin Lancastrian test-bed. As was appropriate on this, the day before the tenth birthday of jet-propelled flight, Heyworth used the two piston-engines almost entirely as supports for two feathered airscrews. After this, H. C. Rogers took the arena in an elderly Canberra (if such a contradiction in terms is permissible, though this one *was* the third of the brood and is unique in being Nene-powered). He made no attempt to emulate Maestro Beamont, but his contribution was effective nevertheless, and seldom far outside the airfield boundaries.

Four as one : the Meteor 8 team from Linton-on-Ouse takes off for formation aerobatics—a perfectly co-ordinated performance. Dense crowds line both sides of Hucknall's grass airfield.



Characteristic plan-form : H. C. Rogers puts the Canberra up for show. This is the Nene-powered version, as may be deduced from the shape of the nacelles, and the absence of intake "spinners."

Johnny Ralling, who has stepped out of aircraft 140 times and presumably therefore enjoys doing so, betook himself from an Auster at 3,500ft and hurtled groundward, looking remarkably like a very small frog disgorged by a hawk. When he at last released his canopy, only about 1,200ft from the expiry of his premium, it stopped him with a jerk that must have been less uncomfortable than it appeared, for he then happily proceeded to perform a trapeze act. One of the most effective jumps we have seen, and a very fair testimonial to Mr. Irvin's wares.

Three ground events that followed—trick-riding by Remount Depot horsemen, an adroit W.R.A.F. P.T. display, and the classic motor-cycle act by the Royal Corps of Signals—raised doubt as to the advisability of putting air and ground events in the same programme, for within a few minutes there was a stampede of thousands of spectators, intent on a close-up view, from the far side of the airfield. With typical Portland Place urbanity, however, B.B.C. commentator Max Robertson eventually coaxed them back behind the ropes, aided by a mild beat-up from a Meteor formation which had been standing-off.

How not to do it

Two C.F.S. Tiger Moths gave an excellent instructor-and-pupil show, the "pupil" performing some horrid-looking stalls, with everything flapping and shivering, and eventually pulling-off a dead-stick landing—unintentionally, some averred.

Eleven Sea Furies from Culdrose, one of them a trainer, put up a sample of the polished formation shows for which that R.N. station is now famed. After some air drill by the whole formation, four of these portly but pretty aircraft peeled off and executed formation aerobatics, of which a climbing roll with the quartette turning about its own axis was perhaps the most effective item. Lt. S. F. F. Shotton was the leader.

R.Aux.A.F. Meteors from No. 504 (County of Nottingham) Squadron, Wymeswold (leader, S/L. G. V. Beardsall) contributed formation drill in a contrasting but no less effective style, and then the Patrouille d'Etampes took the air. This French Air Force "circus" is, of course, unique. We have frequently described it in the past, but for the newer reader we may reiterate that it consists of four Stampe biplanes (145 h.p. Renaults), which are reminiscent of Tiger Moths. Three of them (Capt. Guido, with Lts. Monfort and Menard) gambol a few hundred feet up in a formation so tight that the leading edges of the port and starboard aircraft are literally within a couple of feet of the leader's ailerons; the high spot, perhaps, is a formation vertical climb ending in individual stall-turns and breakaways, each motion of each aircraft being in perfect synchronization. While this artistry is going on, Commandant Perrier (the C.O.) in the fourth machine, makes passes along the front of the enclosures at 30ft or so—inverted. He also appears to be able to start a steep climb, still inverted, with no initial speed over and above his normal gentle cruising; perhaps, of course, it's all done by mirrors. . . .

And now, all the way from Manston, Kent, whence they were returning without an intermediate stop, came a "three-ship formation" of F-84E Thunderjets of the 31st Fighter Escort Wing,

HUCKNALL ON HOLIDAY . . .

U.S.A.F. (Capt. Duane A. Kuhlmann, 2nd Lt. Herman H. Babb, 1st Lt. R. D. Robertson). By contrast with the tightly knit, closely ordered British and French aerobatics we had been watching, theirs was an individualistic performance, for the three pilots mainly contented themselves with individual high-speed passes and dives towards the airfield out of the distant haze: yet it must be admitted that, judged purely as a spectacle, this American contribution was one of the most effective of the day, if only by reason of the dense, ominous-looking trails of black smoke which the Allison J-35s always leave in their wake. One of the aircraft was streaming fuel from its starboard wing-tip tank, and an R/T signal after the trio had departed said that the tank had eventually detached itself.

The programme was fittingly rounded-off with formation aerobatics by four Meteor 8s from Linton-on-Ouse (leader, F/O. Murphy)—though, as we have implied, the crowd was by now so satisfied with "watching the jets roar by" that the precision of the quartette's actions must have been lost upon many of them. Also, too, there were the rival claims of an excellent static show (in which, naturally, Rolls-Royce gas-turbine development was strongly featured) and, last but not least, of a place in the queue for ten shillings' worth of unalloyed joy in a D.H.89.

SHOREHAM'S OPEN DAY

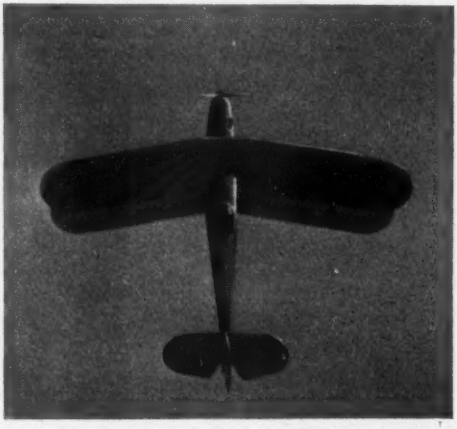
Sussex Wing of A.T.C. Provides Some Edifying Entertainment

THE sun shone benignly over Shoreham Airport on Saturday, May 12th, for the Sussex R.A.F. Open Day, organized by the Sussex Wing of the A.T.C. Though a trifle fresh for real comfort, the wind was in just the right quarter for the flying demonstrations and, having parked *Flight's* Gemini in a fast-extending line of visiting aircraft, we sat back to enjoy ourselves. We were not disappointed.

A march-past by squadrons of the Sussex Wing A.T.C. with A.V-M. H. J. Seward, C.B., C.B.E., A.O.C. No. 61 Group, taking the salute, was a rousing beginning and evidence of a high standard of training. Then F/L. Scott put a Chipmunk of No. 22 R.F.S., Cambridge, through a succession of immaculate evolutions, the purr of the Gipsy at last giving way to the harsh roar of Griffons—in Seafires of No. 1832 R.N.V.R. Squadron, visiting from Culham. We were sorry that 1832 did not round off their formation work with one of the beat-ups for which they have acquired a name.

Not content with a sequence of faultless aerobatics, F/L. Paterson, in a Vampire 5 of No. 601 Squadron, gave a very creditable imitation of a lawn mower, in which occupation he was shortly rivalled by Commandant Perrier, leader of the far-famed Patrouille d'Etampes aerobatic squadron of the French Air Force; but the Commandant, of course, adopted an inverted position in order not to miss a single daisy. (More about the squadron appears in the Hucknall report on the preceding page.)

Arrow-like, a Meteor 8 of No. 263 Squadron, F/L. Latham up, entered the arena and set about inscribing vast arcs in the sky and pulling excruciating amounts of g. Hardly less remarkable than this performance was Latham's almost magical appearance in the control tower after having delivered his Meteor back to base. We took the opportunity to ask how high a certain vertical zoom had carried him after an all-out level run: he estimated 10,000ft.



A spectator's view of Commandant Perrier's Stampe biplane in the position in which it is usually seen during displays by the Patrouille d'Etampes of the French Air Force.

A classic exhibition of how not to fly was given by the individualist from 15 R.F.S., Redhill; his Tiger Moth is seen preparing for a "dirty dart" towards a wondering audience.

But if Latham caused hearts to skip a beat, Johnny Ralling stopped them dead when he fell the best part of 3,000ft from a Tiger Moth before pulling the ripcord of his yellow canopied parachute. In the few seconds between the opening and the touch-down perilously near the crowd, he gave an accomplished gymnastic display in the rigging lines.

By this time another Tiger Moth, which had been labouring patiently skywards for some time with a Prefect sailplane in tow, had positioned itself nicely above the spectators. After being released, F/O. Thomas, of the Home Command Gliding Instructor School, treated the crowd to a sparkling exhibition of powerless flight, his tight loops, low-down, causing some clenched hands and unhappy grimaces to be seen among "initiated" members of the audience.

To keep the pot boiling during an interval in the main flying programme the local Territorials put on a motor-cycling event and an anti-aircraft demonstration, using a frolicsome Chipmunk (F/L. Hubbard) and a chubby Miles Aerovan as targets. S/L. George Thornton showed off a D.H. Dove, and the A.T.C. massed bands filled the afternoon with martial strains.

Following the break for tea, representatives of the three Reserve Flying Schools, Nos. 15, 18 and 22—from Redhill, Fairoaks and Cambridge respectively—each contributed an item. A crazy-flying enthusiast from Redhill tried the patience of his long-suffering Tiger Moth to its utmost, and a formation of Chipmunks from Fairoaks showed themselves to be highly skilled in the art of squadron drill. Another very agile Chipmunk from Cambridge and the time-honoured pupil and instructor act (supplied again by Redhill) terminated an enjoyable afternoon, the success of which can largely be attributed to the fact that the operational side of the programme had been in the hands of W/C. Alan Deere, D.S.O., O.B.E., D.F.C., of Battle of Britain fame.

The B.B.C.'s Charles Gardner and Raymond Baxter gave lively commentaries for local, national and European audiences.

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Vignettes of
CANADA — AIR LAND

For thirty years, Canadians have been blazing air trails in commercial travel. In 1919, Quebec began experimental services. Two years later the first flight down the Mackenzie River was completed. In 1923, Ontario instituted its first air lines. By 1930, the Western Provinces had followed suit.

The Trans-Canada Airway, beginning to swing into operation by 1935, laid the foundation for a trunk service from coast to coast.

Today, across Canada, local services provide air travel into territories previously inaccessible. The two great Canadian Airlines, T.C.A. and C.P.A., flew nearly 30,000,000 revenue miles in 1950.

Canadair
LIMITED, MONTREAL, CANADA

Festival of Desoutter

"Next," said the M.D. "we come to this remarkable structure which, for no particular reason, is called the Skylon. No, Sir, it is *not* intended to convey cabinet ministers to the moon. *That* plan was abandoned when a group of Disruptive Tories treacherously laid a prayer against it and started a rumour that any cheese obtained would be green and unfit for human consumption. The purpose of this Skylon (if you'll pardon the expression) is simply and solely to show the world how to put on nuts and screws with ease, grace and economy. The Skylon, for so we must call it, is 290 feet high or long as the case may be, and clad with no less than 500 aluminium sheets screwed or bolted to a light metal structure. Many thousands of nuts and screws were used and put on wham ! with Desoutter Tools. If you will now follow me to the Dome of Discovery I will show you examples of these remarkable instruments . . ."

But his audience had quietly slid off to Battersea, no doubt, for what a Minister of Works referred to as a spot of slap and tickle.

Desoutter

POWER TOOLS

INCREASE PRODUCTION

DESOUTTER BROS., LIMITED. THE HYDE, HENDON, LONDON, N.W.9. TELEPHONE : COLINDALE 6346 (5 lines). TELEGRAMS : DESPNUCO. HYDE, LONDON.

DC 224

CIVIL AVIATION

JUDGEMENT FOR THE REDS

THE result of the protracted dispute over the legal ownership of the 40 civil aircraft which formerly belonged to the Chinese Central Air Transport Corporation was announced in Hong Kong on May 21st. The Chief Justice, Sir Gerard Howe, ruled that the American-registered company, Civil Air Transport Incorporated, had failed to establish ownership and that the machines were therefore to become the property of the Chinese Communist Government. Two months are being allowed for an appeal.

It will be recalled that the aircraft are part of a fleet of 71 grounded at Kai Tak airport since October, 1949. Sir Walter Monkton, K.C., acting as counsel for the American plaintiffs, said that their claim was made on behalf of the partnership of Gen. Claire Chennault and Mr. Whiting Willauer who, by a transaction in December, 1949, had purchased the aircraft from the Chinese Nationalist Government for $1,500,000. The Chief Justice, however, was of the opinion that this sale was merely a device entered into by both parties in order to prevent the aircraft passing into the hands of the Chinese Communists.

THE PANAGRA DISPUTE

PAN-AMERICAN AIRLINES have asked the C.A.B. to arbitrate in a dispute which has split the board of directors of Panagra, the American international airline jointly owned by P.A.A. and the large steamship interests of W. R. Grace and Company. The joint owners are each represented on the Panagra Board by four members.

The dispute arose in 1949, when Pan American proposed an equipment interchange between National Airlines and Panagra which would provide a one-aircraft service from the north-eastern United States to points in South America. At that time Pan American had an agreement to purchase a 30 per cent interest in National Airlines, while W. R. Grace and Co. had agreed to purchase 18 per cent of the shares. Later, however, National Airlines repudiated their agreement with P.A.A., leaving Grace with a 17.4 per cent interest.

Although Pan American now wish to abandon the scheme for an equipment interchange, the four Grace directors are insisting that the plan goes through. A Pan American spokesman has alleged that control over airlines by shipping interests is contrary to national policy; P.A.A. have asked for a complete investigation of the extent of control by Grace over National Airlines. While unwilling to foster an equipment exchange between Panagra and National, Pan American, however, are pursuing a plan to effect a similar agreement with Eastern Air Lines.

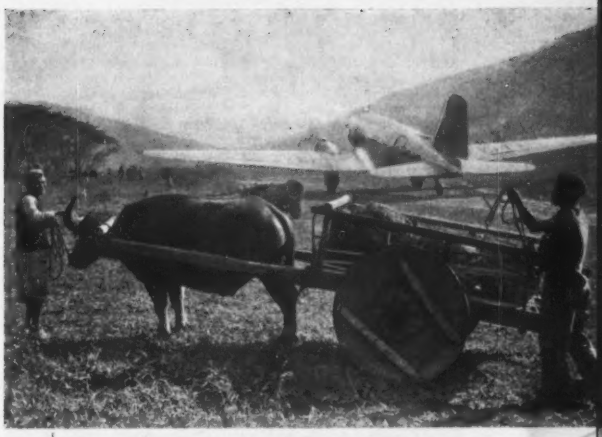
B.E.A. AND PRAGUE

FROM May 18th B.E.A. discontinued their services between London and Prague; and facilities granted for the Czechoslovakian State Airlines to operate services between Czechoslovakia and this country will be withdrawn from June 17th.

For some time the London-Prague flights have been a thorn in B.E.A.'s side as load factors were mostly unsatisfactory; the most regular passengers have hitherto been diplomatic couriers. Apart from the low traffic-potential on this route, however, the general attitude of the Czech authorities in Prague was undoubtedly a deciding factor in curtailing these schedules. A note published by the Foreign Office states that the work of B.E.A.'s office in Prague was being constantly obstructed by the Czechs, whose activities have included intimidation, arrest and interrogation of Czech members of the staff. The note also points out that it has long been the practice of the Czech authorities to give a virtual monopoly in the carriage of air freight between the two countries to the Czech State Airlines. This discriminatory practice has been maintained, the note points out, despite frequent representations by B.E.A. and has affected both Czech exports to and exports from the United Kingdom.

The proportion of freight made available for B.E.A. has diminished progressively, it is stated, and has now become negligible. For this reason the Corporation has decided that continued operation between the two countries is no longer justified.

The Czech flights to Britain were run daily and, although the attitude of the Czecholsovak authoritics has prevented full co-operation, relations between the two airlines themselves have been friendly. Apart from a reduction in route-mileage the Corporation's loss will not be a very real one, however, for the services to Prague have hitherto been run at a loss of £46,000 annually.



WHEELS OF PROGRESS: This delightful study of transport ancient and modern comes from Tonkin, in Northern Indo-China, where Thai tribesmen may sample either the modernity of the local French airline's DC-3 or resort to the rigours of the age-old buffalo-cart.

THE LIGHTEST DAKOTA?

BY making use of the lightest possible materials and equipment, a South African firm of maintenance engineers has turned out what must be one of the lightest passenger-carrying versions of the Dakota in the world. Weighing 1,300 lb. less than the figure for the normal basic-equipped-type, it recently carried out a maiden flight to the United Kingdom. Passenger capacity has been increased by six and now provides for a total of 32 persons plus a crew of four.

The conversion was carried out entirely by a maintenance firm at Germiston. The work entailed replacing the metal floor in the passenger section by stressed wood; the engines, airframe and control layout, however, have not been altered, but a completely equipped galley is now positioned in the crew compartment.

Although the passenger seats are much lighter than those normally fitted, passengers on the maiden flight are reported to have found them "comfortable and relaxing."

U.S. HELICOPTER CONVENTION

THE first official cross-country flight and landing to be made by a helicopter entirely on its autopilot was a feature of a spectacular two-day display organized by the American Helicopter Association at Washington recently. The flight, from Morton to Anacostia, was made by the Piasecki XHJP-1 prototype of the U.S. Navy's HUP-1 seven-seat utility machine. The display included a formation fly-past by 19 different types of helicopter.

The occasion was also marked by a two-day conference in which representatives of the C.A.A. made some encouraging predictions on the future of the commercial helicopter operations. One speaker estimated that, on the basis of a 15-mile block distance and an annual utilization of 2,000 hr, the helicopter operating cost curve would decrease with rising capacity from one dollar to 33 cents, with a tendency for the curve to flatten at the 20-30 passenger categories. Compared with the DC-3 and the proposed Boeing 498-3, however, the helicopter would have 25 per cent higher direct costs. Speeds up to 130 knots were thought to be entirely feasible for pure helicopters without "assisting devices."

AIR CEYLON'S CONSTITUTION

THE new financial arrangements governing the establishment of Air Ceylon, which is operated by A.N.A., were announced recently. The company's capital comprises 2,000,000 rupees, of which the Ceylon Government will provide 51 per cent and A.N.A. 49 per cent. Ceylon will be represented by three directors on the board, the remaining two being Capt. Ivan Holyman, managing director of A.N.A., and Mr. H. F. Walsh, his general manager.

Under the new agreement the A.N.A. shares cannot be trans-

CIVIL AVIATION . . .

ferred or sold without the Ceylon Government having first option; at the end of ten years, however, A.N.A.'s interest can be compulsorily acquired. The two Skymasters operating the Sydney-London service are transferred with A.N.A. property to the Australian register and are chartered by Air Ceylon at a specific rate for each flight.

A.N.A. has now become the principal agent for Air Ceylon in London and Australia and receives a commission of 7½ per cent on all seats sold, and an over-riding commission of 2½ per cent on all tickets sold by sub-agents in London and Australia.

THE AMBASSADOR'S TRIALS

IN the course of an extensive programme of endurance-testing and route trials the first production Ambassador, scheduled for delivery to B.E.A. this summer, recently recorded a total of 52½ flying hours between the morning of May 10th and the evening of May 14th—a utilization of 10 hr per day.

The trials were designed to give the maximum experience value from the required 250-hr endurance test on the Centaurus 661s. By the time the Ambassador comes into service it is estimated that it will have completed 1,500 hr of prototype flying, which is considerably more than most prototypes enjoy before their production counterparts are pressed into service.

The present tests include a period of at least 50 hr under pressurized conditions, the maximum differential being used on each separate flight, while during the 250 hr period in which the power plants must perform without defect, all instruments, electrics and radio must be operated as extensively as possible.

The trials are being carried out jointly by Mr. G. B. S. Errington, for Airspeed, and by Capt. C. E. F. Riley on behalf of B.E.A. A nucleus of Corporation engineers has also been attached to the base at Hurn, from which the proving flights are being carried out. At the time of going to press some 160 hr of the 250 hr required had been completed.

PRESTWICK FEEDER SERVICE

SCOTTISH AVIATION, LTD, have completed arrangements to introduce a new scheduled feeder service between Prestwick and London (Northolt), with a stop at Burtonwood Airport, this summer.

The route will be operated for a period of twelve months beginning on June 8th, and is the result of several applications made last year to obtain feeder services for Prestwick for five-year periods under Associate Agreements with B.E.A. Negotiations are still proceeding for the operation of a similar schedule for a period of two years, between Aberdeen, Errol, Edinburgh, Prestwick and Belfast; it is still thought possible that it may be introduced this summer.

The Prestwick-Burtonwood-London flight is to be made six times a week (Sundays excepted) and has been timed to permit passengers from the Prestwick area to carry out a day's business in Manchester, Liverpool or London and return home the same evening. Fares are: Prestwick-London, £8 single, £11 return; Prestwick-Burtonwood, £4 10s. single, £6 return.

T.O.A. EXPANSION PLANS

TRANS-OCEANIC AIRWAYS have now received the first of the Solent flying-boats which they intend to use on the Sidney-Hobart and Sidney-New Guinea-New Britain services. The first machine was flown out to Australia by Mr. Brian Moncton, T.O.A.'s managing director. Among the passengers was the Hon. Anthony Cayzer, a director of the British Clan and Cayzer-Irvine shipping company, which has acquired a financial interest in T.O.A. On their arrival it was announced that, in addition to the local services now being run, T.O.A. would shortly be extending its operations to overseas routes.

It is known, incidentally, that T.O.A. are anxious to acquire further Solents, but as yet no decision has been reached on the future of the remainder of the former B.O.A.C. boats now lying at Belfast.

BRITISH AIRWAYS OPERATING STATISTICS FOR JANUARY, 1951

(Figures for the corresponding period of 1950 are given in parentheses)

	B.O.A.C. All Areas	B.O.A.C. Western Area	B.O.A.C. Eastern Area	B.O.A.C. South American Area	B.E.A. All Divisions	B.E.A. Continental Division	B.E.A. British Division	B.E.A.'s Associates
Revenue aircraft-miles	2,365,185 (2,143,047)	322,977 (316,712)	1,504,241 (1,359,512)	407,420 (403,199)	1,415,783 (1,148,568)	1,086,451 (840,621)	329,332 (307,947)	33,216 (53,168)
Total aircraft-miles	2,522,585 (2,357,362)	344,679 (335,118)	1,526,343 (1,377,741)	415,411 (408,523)	1,490,094 (1,266,296)	1,114,085 (873,230)	343,274 (318,858)	— —
Revenue passengers	15,355 (11,416)	3,219 (2,058)	8,744 (7,123)	3,392 (2,235)	43,197 (39,603)	26,826 (21,670)	16,371 (17,933)	656 (1,045)
Revenue passenger-miles	43,859,346 (31,315,245)	9,288,152 (5,428,354)	29,801,350 (23,623,384)	4,769,844 (2,263,507)	13,255,462 (12,329,479)	10,511,142 (9,128,703)	2,744,320 (3,200,776)	492,786 (408,984)
Available seat-miles	87,516,845 (60,160,520)	20,089,785 (13,237,811)	52,073,644 (39,741,411)	15,353,416 (7,181,298)	28,436,572 (22,357,105)	21,807,773 (15,910,226)	6,628,799 (6,446,879)	670,215 (714,048)
Revenue passenger load-factor (per cent)	50.1 (52.1)	46.2 (41.0)	57.2 (59.4)	31.1 (31.5)	46.6 (55.1)	48.2 (57.4)	41.4 (49.6)	73.5 (57.3)
Cargo (tons): Mail	180.4 (147.5)	29.7 (33.6)	132.9 (100.8)	17.8 (13.1)	353.2 (297.3)	243.7 (198.9)	109.5 (98.4)	1.1 (0.7)
Freight	434.6 (286.0)	72.9 (45.2)	297.0 (196.0)	64.7 (44.8)	747.1 (511.7)	580.2 (369.5)	166.9 (142.2)	3.2 (2.1)
Revenue load ton-miles	6,854,858 (4,910,014)	1,220,562 (768,671)	4,866,566 (3,682,467)	767,730 (458,876)	1,537,311 (1,420,624)	1,270,081 (1,122,027)	267,230 (298,597)	50,528 (36,760)
Usable capacity ton-miles	13,596,269 (9,789,514)	2,395,275 (1,770,671)	7,703,218 (6,327,138)	2,032,942 (1,618,624)	3,114,075 (2,449,165)	2,492,398 (1,854,787)	621,677 (594,378)	92,679 (100,840)
Overall revenue load-factor	56.5 (50.5)	51.0 (43.4)	63.2 (58.2)	37.8 (28.3)	49.5 (58.3)	51.0 (60.7)	43.5 (51.0)	54.5 (36.5)
Total revenue hours	10,544 (10,236)	1,306 (1,337)	6,863 (6,573)	1,786 (2,063)	9,781 (7,893)	6,932 (5,212)	2,849 (2,681)	247 (417)
Total non-revenue hours	786 (1,270)	98 (89)	111 (107)	38 (34)	570 (895)	194 (218)	137 (110)	— —
Equivalent annual utilization (revenue hours) per aircraft	1,953 (1,435)	— —	— —	— —	1,275 (1,074)	1,569 (1,353)	893 (767)	— —
Unduplicated route-miles in operation at end of period	65,978 (71,435)	8,074 (7,713)	40,009 (43,782)	17,895 (19,940)	16,101 (11,882)	13,169 (9,495)	2,932 (2,387)	2,123 (2,355)
Percentage regularity	99.3 (95.9)	96.5 (94.2)	99.9 (96.1)	98.7 (96.3)	85.9 (94.4)	84.0 (92.3)	87.9 (96.0)	89.3 (95.2)
Average length of stage flight (miles)	1,102 (1,047)	1,475 (1,218)	1,107 (1,082)	907 (858)	231 (222)	348 (366)	114 (112)	199 (168)

ALTHOUGH the weather in January was not conducive to good regularity, figures now available show that U.K. airlines carried 13.7 per cent more passengers, 48.1 per cent more freight and 20 per cent more mail than in the corresponding month of the previous year. Of the total of all passengers (59,208) who flew during the month, 43,011 were carried on international services. Passenger-mileage rose by 30.8 per cent to a total of nearly 58,000,000. B.O.A.C. accounted for 15,355 of the passenger total, an increase of 34.5 per cent over last year's figure, in passenger-miles also (43,859,346) the total was 40.1 per cent more than in January 1950. Most of this improvement was seen on the North Atlantic routes, where the increase was over 70 per cent.

B.E.A. carried 43,197 passengers (a gain of 9.1 per cent) and flew more than 13,000,000 passenger miles (7.5 per cent more than a year ago). B.E.A.'s total of revenue load ton-miles (1,537,311) was achieved for an offered capacity figure of 3,114,075 miles, the overall revenue load-factor having fallen rather sharply from 58.3 in January 1950, to 49.5 in January 1951.

Although the Corporations' associate companies carried fewer passengers in January, they did experience a satisfactory increase in the carriage of mail and freight and recorded an overall revenue load-factor of 55 per cent, as compared with 37 per cent last year. The principal traffic statistics for the two Airways Corporations and B.E.A.'s associate operators are given in the table above.

BREVITIES

THE Indian Government will shortly take over Deccan Airways, who operate services between Hyderabad and the major cities of India. An Air Transport Enquiry Committee recently recommended nationalization of the 12 Indian-owned companies.

* * *

Rumours now circulating in American newspapers suggest that a "giant 206-passenger transport", powered by four turboprops, may go into production as soon as world conditions permit. The aircraft would be a development of the Lockheed Constitution now used by the U.S. Navy.

* * *

The Committee of Ministers of the Council of Europe, which met recently in Strasbourg, heard a proposal by Count Sforza, of Italy, that the Council's member-governments should merge their airlines. This, he maintained, would assist European airlines in the face of strong American competition. The ministers referred the proposal to the Consultative Assembly, whose economic committee has adopted a report dealing with the standardization of European airlines.

* * *

Experimentally powered by four General Electric J.47 turboprops, a development of the Chase C-123 troop- and cargo-carrying glider recently made its first flight in the U.S.A. Although performance details are secret, it is reported that the C-123 was airborne in less than 600ft.

* * *

Despite the unusually bad flying weather during January, the British Corporations carried 13.7 per cent more passengers and 48.1 per cent more freight than in January, 1950. Passenger-mileage also rose by 30.8 per cent to a total of nearly 58,000,000.

* * *

Two S.O. 30 Bretagne twin-engined transports have been ordered by Air Maroc. They will include the aircraft which has already flown about 400 hr for Iranian Airways but which, owing to financial difficulties, the company has had to return to the manufacturers. Existing orders are in hand for 12 aircraft, earmarked for delivery during the next 12 months.

* * *

Slick Airways, Inc., American internal operators, have announced an order for three additional DC-6A Liftmasters. The new purchase brings to six the total of all-freight aircraft of this type which Slick has acquired from Douglas during the past six months. The first Liftmaster of the order was delivered this week

* * *

Mr. Stuart Campbell, the Director of Air Navigation in Australia, has been appointed Technical Adviser on Aviation Services to the Government of Thailand. He will advise on the organization and operation of civil services under the United Nations joint assistance programme for technical aid to under-developed countries.

SHOWPIECES; These two new products of the French Morane-Saulnier factory are to be exhibited at the Paris Show in June. They are (above) the Morane 700 Petrel, which may be powered by Potez or Argus engines and is designed for "colonial duties," and (below) the Morane 730, a side-by-side primary trainer which may be powered by either Argus-Salmson or Potez engines of approximately 240 h.p.

FROM THE CLUBS

AN unusual but useful occupation for flying-club members in Malaya—that of pay-dropping to outlying estates and mines—is now a regular feature of private flying in that country. No small share of these duties is borne by the Kuala Lumpur Flying Club, a very active organization with 600 members, which at present operates three Tiger Moths and four Austers.

While pay-dropping operations in the immediate vicinity of Kuala Lumpur and the coastal area are not particularly difficult, the task of crossing the mountains into Pahang in low-powered aircraft with little or no reserve of petrol can be a little hard on the nerves. On occasions these flights have entailed forced or precautionary landings in areas with a reputation for banditry, but so far the pay-dropping scheme has been carried through without serious incident. In January and February of this year, incidentally, most of the Pahang trips over the mountains were made by a woman member of the club, Mrs. Anne Burnett-Rae. Since the Kuala Lumpur club began dropping pay to scattered planters and miners in 1948, the surprising total of over $60,000,000 has been safely delivered.

A member of the club, Mr. T. A. L. Concannon, who is now in England, tells us that specially designed canvas bags are used and that the dropping technique involves a preliminary pass over the area, to make sure that the rightful owner has not been whisked away by bandits. This is followed by a low-powered approach culminating in a shallow "dive-bombing" attack which deposits the cash, literally, on the doorstep of the plantation manager. Although, on occasions, bags have been known to burst, thus far not a single dollar has been lost.

The work is carried out entirely by amateur pilots, several of whom, incidentally, possess a Malayan "B" licence, which enables them, when necessary, to fly for hire or reward for the benefit of their club.

THERE is news of yet another event to be added to this year's very full fixture-list of international air rallies. It is known as the "International Air Rally of the Swiss Watch" and is being organized by the Aviation Club of Bienne. The event will mark the 50th anniversary of the Aero Club of Switzerland and is to be held at Bienne-Boujean airfield from July 6th-9th. Although it clashes with the dates of the R.Ae.C. La Baule Rally (July 7th-8th) the attractive programme and the glories of the Swiss scenery will undoubtedly produce a considerable number of entries.

A car is being placed at the disposal of each participating crew and the programme includes a number of visits to places of beauty and interest in the locality. As a souvenir of the stay in Bienne every participant will be presented with a Swiss-made watch.

Intending entrants should note that application forms must reach the organizers before June 10th. Fees, which include meals and service from Friday until Monday morning, amount to Swiss Fr. 90 per aircraft and pilot, and Fr. 85 for each passenger.

DETAILS are now available of the course and prizes for the Welsh Air Derby, which is to be a feature of the Swansea and District Flying Club's air pageant at Fairwood Common airfield on Saturday, June 9th. The race will be flown over three laps of a course from Fairwood Common, passing *via* Whiteford Point, Burry Holms, Oxwich Point and returning to Fairwood Common—a distance of 25.38 miles.

There is an attractive first prize of £125, with second, third and fourth prizes of £75, £50 and £25 respectively; a special award of £25 is also offered to the entrant of the winning aircraft in an ultra-light category which, in this case, means aircraft not exceeding 1,200 lb a.u.w. and having a power-rating of less than 70 h.p.

The pageant programme will include the French Patrouille d'Etampes, a display of parachute jumping and also aerobatics by Meteors of No. 614 (County of Glamorgan) Squadron, R.Aux.A.F.

THERE is one addition to the list of entries (published in *Flight* last week) for the Goodyear Trophy Race, to be flown from Wolverhampton airfield this Saturday, May 26th. The additional pilot is D. J. Jemmett, flying his own entry, a Proctor I. He will therefore be competing in the race against his brother, D. C. Jemmett, who is piloting a Hawk Trainer III.

The accompanying air display, which begins at 2 p.m., will include a mass parachute jump, a demonstration of the Boulton-Paul Balliol and air drill by a formation from No. 25 R.F.S. There will also be an individual parachute jump, and demonstrations by the Wyvern and the Sapphire-powered Lancaster.

At 3 p.m. the programme will be interrupted for the race, which is being flown without eliminating heats.

SERVICE AVIATION

Royal Air Force and Naval Aviation News

TREBLE TROUBLE for submarines is forecast by the addition of a third man to the crew of the Fairey 17, now in production for Naval Aviation. This view shows the new rear cockpit; "clear-vision" enclosure for the forward cockpits, à la Fairey Primer; very capacious bomb bay; and installation of the Armstrong Siddeley Double Mamba.

George Medal for R.A.F. M.O.

LAST December, Transport Command decided to cut their England-Singapore time schedule from five to two and one-half days by stopping only for refuelling and change of crews. Until then there had been an overnight stay by passengers and aircrew at each of the staging posts : Ceylon, Karachi, Fayid and Malta, the same crew taking a Hastings on the round trip from England to Singapore and back.

The machine on the proving flight was due to arrive back in England a few days before last Christmas but, unhappily, it crashed in North Africa. Four of the crew were killed but all the passengers, who were in rearward-facing seats, survived.

S/L. T. C. L. Brown, M.B., B.S., M.R.C.S., L.R.C.P., a passenger in the aircraft, gave up his chance of safety by going forward to attend to the injured pilot from the time that an airscrew came adrift to the actual impact of the crash. For this he was awarded the G.M. The citation reads : "On the night of December 20th, 1950, he was engaged in a route-flying fatigue trial from Singapore, for headquarters, Transport Command. During the flight a propeller blade broke loose from one of the engines of the Hastings aircraft in which S/L. Brown was a passenger.

"The blade cut through the fuselage and seriously injured the co-pilot, who was lying on the bunk in the crew's compartment. It also severed the control cables to the rudder and elevators; within a few seconds the faulty engine fell out of the aircraft.

"S/L. Brown immediately went to the aid of the injured pilot and, although he fully appreciated the danger involved, administered medical aid until the aircraft crashed. When all others were at crash stations he remained at his post with the injured man. If he had been prepared to leave him, he could have taken up a position in the passenger cabin on one of the stressed, backward facing seats, all of whose occupants escaped serious injury. The crash took place at Benina, killing five members of the crew, including the injured co-pilot. S/L. Brown was himself seriously injured and there is no doubt that he consciously risked his life in order to save that of the injured officer. He carried out his duties in accordance with the traditions of his profession without regard for his own personal safety.

"He has set an outstanding example at all times and has completed 80 parachute descents from balloons and aircraft in the course of his duties with the parachute school."

In connection with the same accident the King's Commendation for Valuable Services in the Air go to : S/L. W. G. James, A.F.C. (Killed); F/L. G. Tunnadine (Killed); F/S. I. A. Johns (Killed); Sgt. G. J. Bain (Died of injuries); Sgt. W. A. Slaughter and Sgt. P. E. Walker. All are from No. 53 Squadron, except S/L. James, who was serving with No. 99 Squadron.

The King's Commendation for Brave Conduct goes to Cpl. A. T. D. Gilmer, No. 4 R.A.F. Police Wing, Singapore.

Cooper Trophy Accident

WE deeply regret to record the death of S/L. K. T. Lofts, D.F.C., the commanding officer of No. 604 (County of Middlesex) Squadron, R.Aux.A.F., as the result of an accident while competing in the eliminating heats of the Cooper Trophy race. The Vampire he was flying crashed while cornering at Great Swifts Park, Cranbrook, Kent, on Sunday last.

A Squadron a Month

MR. BROOKE CLAXTON, the Canadian Defence Minister, has said that by the end of this year Canada will be forming new jet-fighter squadrons at the rate of one per month. This is on the basis of 25 aircraft per squadron. It is expected that the planned rate of production of the F-86E Sabre, at the Canadair factory in Montreal, will be reached this autumn. That of the CF-100 (Canuck) should be reached early next year in the Malton, Ontario, plant of A. V. Roe (Canada), Ltd.

Cairo-Cape-Cairo Anniversary

TWENTY-FIVE years ago, on May 27th, four Fairy 3D biplanes landed at Heliopolis after having completed the 10,620-mile return flight from Cairo to Cape Town and back.

Led by W/C. C. W. H. Pulford, the flight made 27 stops on the outward journey and 26 on the way back. Floats were then fitted to the 3Ds and on June 9th the four aircraft left Alexandria for England, where they arrived—at Lee-on-Solent—twelve days later, bringing the total mileage flown to 14,000. The nearest comparable R.A.F. flight in recent times is that made by S/Ls. Martin and Sismore in May 1947, when they flew their Mosquito from El Adem, N. Africa, to Cape Town in 15½ hours with one stop, at Kisumu.

W/C. Pulford rose to the rank of A.V-M. and, while A.O.C. Far East in 1942, died of malaria after escaping from Singapore.

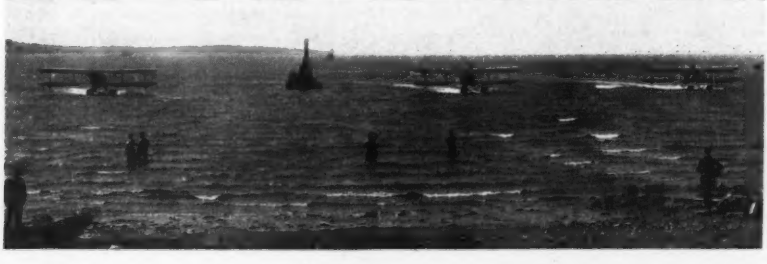
C.F.S. Reunion

THE Central Flying School is holding its annual reunion for past and present members of the staff on July 20th at Little Rissington. Any officer who has not received notification by June 21st is requested to write to the chairman of the reunion committee at Little Rissington, Gloucester.

"Theseus" Coming Home

AFTER six months in Korean waters the carrier H.M.S. *Theseus* is returning to Britain and expects to berth at Portsmouth on May 29th.

The ship's operational record now shows



BACK FROM THE CAPE: Three Fairey 3Ds taxying up to the slipway at Lee-on-Solent 25 years ago (see the paragraph on this page).

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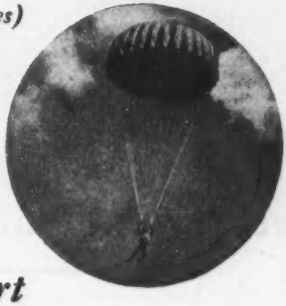

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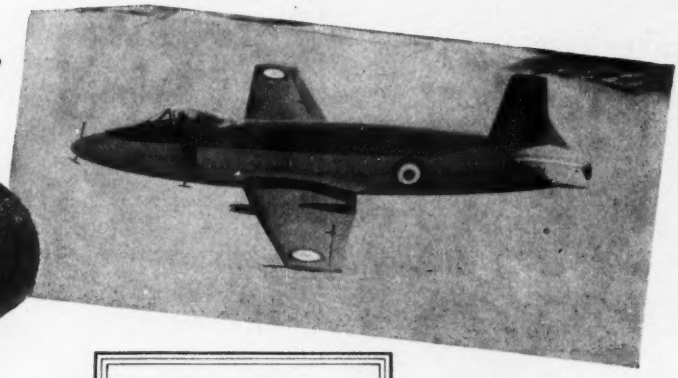

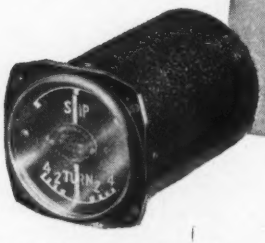

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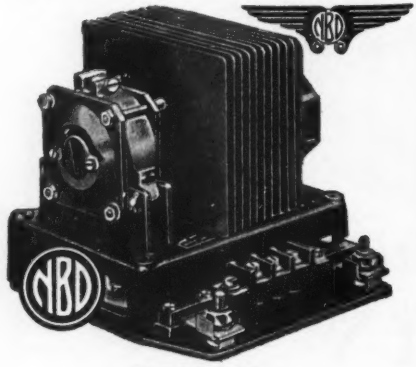

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SERVICE AVIATION . . .

that 4,446 sorties have been flown from her flight deck. On leaving Korea the commanding officer, Capt. A. S. Bolt, D.C.S., R.N., received congratulatory messages from the United States Naval forces with which the *Theseus* has been serving.

The carrier has been replaced in the Far East by H.M.S. *Glory*. (Capt. K. S. Colquhoun, D.S.O.).

Australian A.A.F.

IT is learned that Australia's Citizen Air Force and University squadrons will in future be known as the Auxiliary Air Force. The Citizen Air Force is now directed into four categories: (1) Auxiliary Air Force; (2) Active Reserve (1,000 officers and 9,000 airmen); (3) General Reserve; (4) National Service.

The National Service trainees serve for six months' full time in the R.A.A.F. and then go to the General Reserve for four and one-half years.

Naval Aviation in Home Waters

THE naval flying-training programme to be followed this summer allows for H.M.S. *Illustrious* (Capt. S. H. Carlill, D.S.O., R.N.) remaining as the trials carrier, but she will cease to carry out any training.

Deck landing and batsmen training will take place in H.M.S. *Triumph* (Capt. C. T. Jellicoe, D.S.O., D.C.S., R.N.) from the middle of May, when H.M.S. *Vengeance* (Capt. R. Gotto, C.B.E., D.S.O., R.N.), which has been temporarily employed on this duty during the refit of *Illustrious*, will join the Home Fleet for full operational duties.

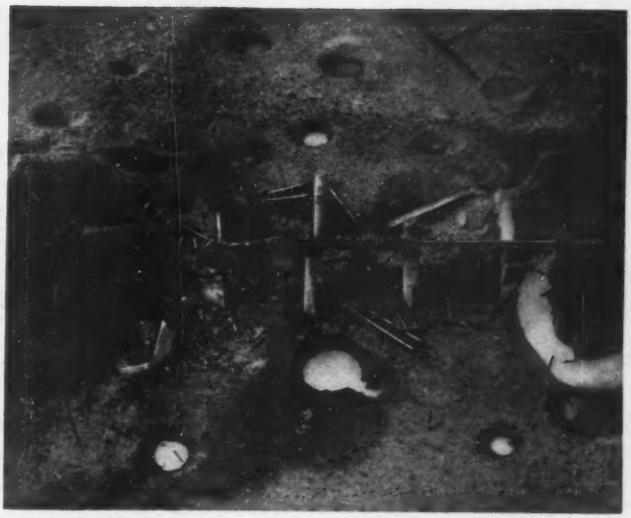
The first all-weather air group—No. 809 Squadron with Sea Hornets and No. 814 Squadron with Fireflies—has embarked in H.M.S. *Vengeance* and will work up in advanced night flying techniques.

H.M.S. *Indomitable* (Capt. M. L. Power, C.B.E., D.S.O., R.N.), which has an operational air group on board, will remain as the flagship of the Home Fleet.

N.A.T.O Aircrews

AIRCREW from five Continental N.A.T.O. nations—Norway, France, Holland, Belgium and Italy—have been training at R.C.A.F. schools in Canada since last autumn and the first batches are now qualified. Twenty navigators received their "wings" on May 4th and 60 pilots were presented with theirs at Centralia, Ontario, on May 18th. A further batch of 20 navigators will finish their course at Summerside on June 1st.

It will be remembered that the scheme originally provided for training 100 aircrew from North Atlantic Treaty nations and a further 200 from the R.A.F. during 1951. A later offer by Canada increased the total number to 1,100 per year and it was recommended that all the additional vacancies should be allocated to R.A.F. trainees.



UPSETTING THE TIMETABLE: Effective air bombardment, by Naval Aviation Fairey Fireflies, of a railway bridge north of Sariwon in Korea. It was attacked with 500-lb bombs.

New C.O. for No. 77 Squadron

TO succeed S/L. R. Cresswell, who has commanded the unit since last September, W/C. G. H. Steege, D.S.O., D.F.C., of Sydney, has been appointed to command the Australian fighter squadron, No. 77, in Korea.

Visit of Canadian Coastal Squadron

A ROYAL Canadian Air Force maritime squadron (No. 405) is to fly to England at the end of this month for anti-submarine training exercises with R.A.F. Coastal Command.

The squadron, which is equipped with Lancasters, and is commanded by S/L. A. G. Dagg, will remain in the United Kingdom for five weeks. It will fly from Greenwood, Nova Scotia, to St. Eval, Cornwall, where it is expected to arrive on May 28th. Ground crews will arrive in aircraft of Air Transport Command, R.C.A.F.

During its stay No. 405 Squadron will be under the control of Coastal Command and will operate from Ballykelly, Northern Ireland as well as from St. Eval. The visit has been arranged to coincide with the major naval exercises in which Coastal Command is participating.

Helicopter to Fly Folded

WHEN a Bristol 171 (Sycamore) is delivered by Bristol Freighter to the R.A.A.F. it will be the first aircraft ever to travel as air freight from England to Australia.

The flight, which is planned for June, will be an all-Australian effort; the R.A.A.F. crew from No. 34 Squadron are taking delivery of the Freighter as well.

Dunning Memorial Cup

FOR obtaining the highest marks while taking the unit training course at the Joint Anti-Submarine School, No. 38 Squadron, commanded by S/L. W. J. O. Coleman, D.F.C., has been awarded the Dunning Memorial Cup.

This prize was presented in 1917 by 50 officers of the R.N.A.S., among them Wing Capt. A. M. Longmore—now Air Chief Marshal Sir Arthur Longmore—to perpetuate the memory of Sqn. Cdr. E. H. Dunning, D.S.C., who was the first British officer to alight on a ship under way. He lost his life while making a second attempt.

Presentation of the cup to No. 38 Squadron was made at Gibraltar by Air Marshal Sir Charles Steel, A.O.C. in C. Coastal Command.

Royal Tournament

MASSED drill and "maze" marching will be one of the principal R.A.F. contributions to the Royal Tournament in June. The R.A.F. Central Band will be in the arena and the Provost branch will demonstrate their ever-popular trained Alsatian dogs.

Bands from No. 1 School of Technical Training (Halton) and No. 61 Group A.T.C. will represent the R.A.F. in the 21 bands to be drawn from Service cadet units.

S/L. W. A. G. McLeish (left) and F/L. O. G. Nelson, who have both been awarded the Air Force Cross for their work while serving with No. 103 Search and Rescue Unit, R.C.A.F. On one trip to Baffin Land, S/L. McLeish landed a Lancaster on an unknown and unprepared ice surface.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

The Corporations and Charter Operations

IN his letter published in your issue of April 20th, Mr. Stuart-Shaw sets out to "debunk the unrealistic nonsense" concerning the Corporations' charter activities, and apparently advocates that the quotations offered by the Corporations for the charter of their aircraft should not include a loading comprising a proportion of their general overhead costs. In other words, this seems to mean that the Corporations should be allowed to make a quotation based on the direct cost of the charter of the aircraft, whereas the companies whose sole business is air charter must obviously add to the direct cost of each charter a proportion of their overheads.

This is clearly unfair commercial competition, and Mr. Stuart-Shaw's specious argument that the profits from such charter operations would reduce the Corporations' deficits is unsound. When the Civil Aviation Act was passed in 1946 a specific assurance was given (by the Parliamentary Secretary, Mr. Ivor Thomas, *vide* Hansard for May 21st, 1946) that the Corporations would not compete unfairly with the charter companies; accordingly it behoves the Corporations to arrange the scale of their activities so that they may reduce their deficits without breaking this pledge.

Mr. Stuart-Shaw refers to his experience, when in B.O.A.C., of "the frustration of being unable to compete in the charter market because every quotation was so weighted with overheads that it was farcical to submit it to a possible client"; the answer to this is not to submit quotations which ignore the existence of overheads, but to reduce the overhead costs which exist and which at present are borne by the taxpayer.

Derby. D. W.

South Bank Aircraft

I HAVE read with interest your Editorial (May 4th) regarding the aircraft section of the South Bank Exhibition.

I do agree most emphatically with your remarks in regard to the Gloster-Whittle E.28/39. It was always my intention to have this most important historical exhibit on show, as can be seen from my original script for the display in this section. Unfortunately, all efforts to borrow this and some other items from the Science Museum were unsuccessful, as instructions were given for the museums to put on special shows during the Festival period, and they, of course, were not allowed to release their finest exhibits.

With regard to the showing of two sailplanes, I was forced by the S.B.A.C. to show both or none at all, and I felt that it was most important to show, if possible, some full-size modern aircraft. As you know, the Olympia Eon holds the British National Height Record, and the new Slingsby Sky is probably the most efficient sailplane built to date anywhere in the world, and on this score I consider they should be shown.

London, S.W.1. P. WARING,
Industrial Officer (Aircraft),
Council of Industrial Design.

The Longbridge Battles

MAY I, in fairness to those concerned, correct a statement published in a letter from Mr. P. R. Hornidge (May 4th) to the effect that the Austin-produced Fairey Battles were "never landed at Longbridge"?

Several hundred of these aircraft were tested at, and delivered from, Longbridge. Wartime dispersal requirements, and the advent of a balloon barrage of remarkable density, considerably reduced the number of landings at this astonishing flying ground, but landings were frequently carried out, despite balloons and other snares, right up to the end of Battle production from this factory.

Northam, N. Devon. L. M. KELSEA-WILLIAMS.

Rearward-facing Seats

THE statements attributed to Mr. Masefield in your report of the R.Ae.S. discussion, "Air Travel from the Passenger's Point of View" (May 11th issue), suggest that the head of one of Britain's greatest air passenger undertakings is not "sold" on the idea of backward-facing seats for the reason that "it did not seem the ideal arrangement to have a door at the back and a lot of goggling eyes facing the passenger when he went in."

Of all the red herrings drawn across the trail of serious consideration of such an elementary precaution as rearward seats, this must beat all! Mr. Masefield evidently prefers to treat the subject with levity, but, taking his comment on its face value, one infers that he cannot have looked round the inside of a passenger aircraft in recent years. Anyone knows that when passengers are seated, in modern aircraft seats, the headrests of the seats in front prevent any direct view along the aircraft to the door, and this therefore screens the passenger entering the door from the seated passengers' view, whether or not the latter's seats face aft. But even if this were not so, what on earth does it *matter* whether a passenger should be fleetingly exposed to such a very minor embarrassment on entering an aircraft, compared to hours of unnecessary potential danger in flight which could be minimized if such a very unlikely embarrassment were ignored? Moreover, even if there were any substance in Mr. Masefield's objections, it would be simple to avoid them by providing another entrance door *forward* of the seats rather than to do so by forfeiting the immense advantages of backward facing seats—always provided an equally effective form of rear emergency escape were retained.

Both Mr. Masefield and Captain Parker agree on one surprisingly revolutionary theory, however—they both think it is better not to have a crash at all rather than to have one and face the chance of burning to death! It is also better for ships not to sink—but lifeboats and lifebelts are still provided, perhaps because mariners have had enough time to realize that the way to Davy Jones is paved with "good" intentions. In other words, aircraft will crash, and ships will sink, however much wishful thinking we may indulge in. (Much of the fire risk present in modern passenger aircraft today could, in any case, be reduced by the universal adoption of flexible fuel tanks; together with the elimination of fuselage fuel tanks, save, perhaps, where they are jettisonable; plus the use of fireproof bulkheads in the fuselage, and impact-operated fire extinguishers and electrical services cut-out switches, as standard equipment.)

It would be as logical to scrap fire-tenders on airfields on the plea that it is better to concentrate on preventing accidents rather than to minimize their effects when they occur, as it is to refrain from providing rearward facing seats for such a reason. Our Messrs. Facing-Both-Ways of Aviation certainly have a curiously blind spot where air safety is concerned!

East Twickenham, Middlesex. DENIS HORNSEY.

[Our correspondent's opening paragraphs are a little unfair to B.E.A.'s chief executive: as was apparent from the report, the debate was not an altogether serious one and, that being so, it would have been a pity to omit the more entertaining remarks from our precis of the proceedings.—ED.]

Overworked King's Messenger?

ASSUMING that *Flight* of May 11th accurately reported the R.Ae.S. discussion of "Air Travel from the Passenger's Point of View", might I, here and now, commiserate with Mr. Huntington, King's Messenger, on the arduous nature of his duties? Eight thousand flying hours per annum, or 21.9 hours per day, is surely too much flying. Does he have time to deliver his diplomatic bags, or are they parachuted to our embassies and consulates?

Brentford, Middlesex. L. TAYLOR.

[Apologies to Mr. Huntington, to whose flying hours a nought was inadvertently added. Actually, he quoted a figure of "between 800 and 1,200 per annum."—ED.]

FORTHCOMING EVENTS

May	26.	Newcastle-on-Tyne Air Display.
May	26.	Wolverhampton Aero Club: "At Home" (sponsored by A.B.A.C.) and Goodyear Trophy Race.
May	31-	Iranian International Rally.
June	3.	
June	2.	Auster Flying Club: Rally, Rearsby.
June	3.	Auster-Ragosine Homing Trophy, Rearsby.
June	8-10.	Air Circuit of Sicily.
June	8-15.	Spanish International Rally.
June	9.	Rally and Race, Fairwood Common Aerodrome, Swansea.
June	9-10.	Royal Air Forces Association: Annual Conference, Torquay.
June	10.	Lancashire Aero Club: "At Home" (sponsored by A.B.A.C.).
June	15-18.	Royal Danish Aero Club: International Rally.
June	15-	
July	1.	Paris Aero Show.
June	23.	R.Ae.C.: Festival of Britain National Air Races, Hatfield.
June	24.	International Rally, Pisa, Italy.
June	24.	Northern Heights Model Flying Club: Gala Day, Hawker Airfield, Langley.
June	27-28.	Institute of the Aeronautical Sciences: Annual Summer Meeting, Los Angeles.
June	30-	Cognac International Rally, France.
July	1.	
June	30-	R.Ae.C.: Members' Deauville Rally.
July	2.	
July	1.	International Rally, Savona, Italy.

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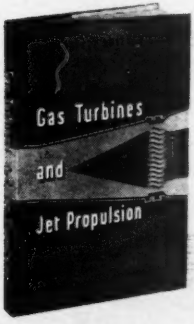

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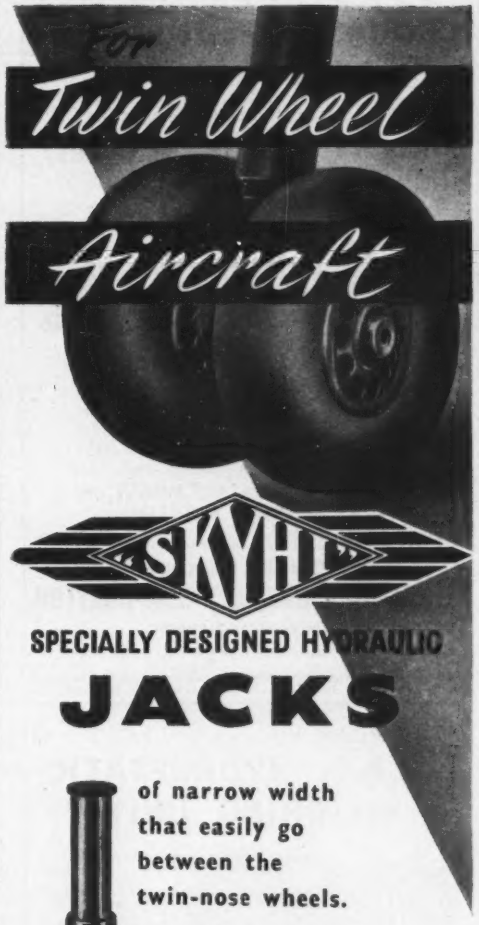

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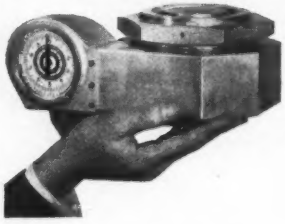

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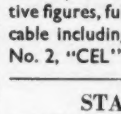

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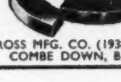

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DOWTY EQUIPMENT, Ltd., Aircraft Hydraulic Engineers, Arle Court, Cheltenham, require design draughtsmen, preferably with some knowledge of hydraulics and landing gear components for aircraft. Write: Personnel Manager, giving details of training and experience, and mentioning age and salary range. [0802

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APPLICATIONS are invited by the Ministry of Supply for an unestablished appointment in the grade of senior scientific assistant at the Royal Aircraft Establishment, Farnborough, Hants, to undertake observation work on parachute trials, analysis of film records and supervision of parachute packing. Candidates must be at least 27 years of age, should have School Certificate, Ordinary National Certificate (Mechanical Engineering) or equivalent qualification. Specialised experience of parachute work in H.M. Forces or elsewhere is required. Salary will be determined on age and on an assessment of the successful candidate's qualifications and experience within the range £380-£520.

APPLICATION forms obtainable from Ministry of Supply, Est. 3 (c) I, Adelphi, Strand, London, W.C.2, quoting V.R. 671. Completed forms should be returned to this address by June 16th, 1951. [6382

MARSHALLS, Airport Works, Cambridge, require for operation of Beaufighter and Spitfire aircraft at Little Snoring, Norfolk, the following staff: pilot-manager, chief engineer, aero-engine fitters, airframe fitters, aerodrome control officer, M.T. fitters, storekeeper, radio/electricians, head clerk, D/F operator, timekeeper, aircraft refuellers and handlers. Applications, with full details of past experience, to Personnel Manager Marshalls, Airport Works, Cambridge. [6357

APPLICATIONS are invited by the Ministry of Supply from applied mathematicians, physicists or mechanical or aeronautical engineers for an unestablished appointment in the grade of senior scientific officer or scientific officer at an experimental aircraft establishment in Southern England, for research investigations and flight testing techniques of helicopters. Candidates should have a 1st or 2nd class honours degree with experience in aerodynamics and interest in helicopters. For the senior grade, candidates must be at least 28 years of age with a minimum of 3 years post-graduate research experience. Salary will be determined on an assessment of the successful candidate's age, qualifications and experience within the ranges: senior scientific officer £670 to £930, scientific officer £360 to £620. Rates for women somewhat lower. Posts carry benefits of F.S.S.U. Application forms obtainable from Ministry of Labour and National Service, Technical and Scientific Register, (K), York House, Kingsway, London, W.C.2, quoting A.157/51A. Closing date June 22nd, 1951. H.Q. 317-75 5/51. HB. [6381

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